

THE MONIST

DEVOTED TO THE PHILOSOPHY
OF SCIENCE

VOLUME XL

THE OPEN COURT PUBLISHING COMPANY

CHICAGO

LONDON

1930

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THE MONIST

RELATIVITY WITHOUT PARADOX

THERE are many to whom the Theory of Relativity still remains incomprehensible, not because of its patent technicalities, but rather in its basal principles. Thus the Theory is regarded as essentially paradoxical except to mathematicians; students have abandoned the effort to understand it, and remain content to accept it as undeniably true, in the light of the two criteria of pure demonstration and experimental verification by Astronomy and Physics.

It can not be too emphatically insisted that such an attitude is thoroughly unscientific, since it obviously assigns to the Theory that highly questionable status, supposedly enjoyed by theological dogmas, of a mysterious truth accepted perforce without being understood; a standpoint by no means foreign to Philosophy itself, as in the familiar instance of Kant's discussion of Freedom and allied subjects. But in fact there is nothing literally paradoxical or contradictory about the Theory in itself. On the contrary, it resembles every important scientific theory in being simply the logical outcome of natural phenomena; these being what they are, the Theory is their inevitable explanation. It is clearly revolutionary; but so was the Copernican Theory. It is abstract and obscure; but all advanced Mathematics is of this order. At first it seems to contradict ordinary experience; but so did the idea of antipodes. The initial requisite towards grasping the essence of Relativity, then, is to exclude the preconception that it is inherently

incomprehensible to the lay mind, and thus to perceive that all its difficulties are due, first to its mathematical technicality, and secondly to its fundamental expansion of our familiar views of Nature. This is so thorough that it inevitably acquires that false appearance of paradox and mystery which I have just repudiated. When, on the other hand, it is gradually approached from phenomena already familiar to everyone, Einstein's Theory falls (in my opinion) within the grasp of all intelligent minds, especially if another source of obscurity is avoided—that is the prevalent confusion between the purely scientific Theory and all philosophic problems of Relativity. Einstein's Theory is purely scientific; it certainly carries with it philosophic implications of the first importance; but these are conclusions to be inferred from the Theory, not presuppositions brought in advance to its interpretation. The majority of physicists are not concerned with any philosophic issues whatever; and it is undeniably misleading that the term "Relativity" should be used in both contexts.

We must begin, then, by excluding philosophic problems at the outset, such as the question of the essential nature of Space and Time, Motion and Matter, Subject and Object. We may return to these, but only at the end of our enquiry; and we must next recognise that certain modes of Relativity in general have long been perfectly commonplace, although these also appeared at first to be hopelessly paradoxical. The historic reform of the calendar, and the widespread opposition thereby aroused, plainly show that Relativity affects our whole reckoning of time, exactly as the adoption of Summer-time does on a smaller scale; while it is now, of course, easily possible for an American paper to foretell the future by reporting, in the afternoon, an event which happened in England on the same evening—an apparently paradoxical inversion of time order. Sim-

ilarly with sunrise and sunset; both are essentially local—*i.e.* relative—affairs, and paradoxical to only stupid minds; and the next point to notice is that the resultant discrepancies can always be compensated by simple calculations that are commonplaces of civilised intercourse. But simple as these are, they fulfil exactly the same purpose as the abstruse Lorentz equations and transformations of Relativity Theory. There is no difference whatever of principle between them, but only in the delicacy and intricacy of the phenomena with which the latter deal, as contrasted with the patent events of everyday. This should become clearer if we imagine a group of men colonizing the Moon. If they were ignorant they would be mystified by the general reduction in weight, while the knowledge of gravitation and arithmetic would enable them to apprehend the conditions and to correlate their observations with people on the Earth. This instance is again simple; still the close connection between weight and mass should prepare us to discern the analogy to the increase of mass, as velocity increases, which is all-important in modern Physics; while that velocity is itself always relative is obvious to every traveller.

Thus the essential point is to realise that the basal *principles* of Relativity are readily discernible in quite familiar events; so that to specify these principles should remove the mystery usually ascribed to Einstein's Theory. This is true with respect to even one of the most perplexing of all its features—the curvature of Space-time and the consequent finitude of the material Universe. Let us approach this by imagining two of our savage ancestors, ages ago, quarrelling and then deciding to part never to meet again. One travels due East, the other due West, each believing that the farther he travels the greater is the distance between himself and his enemy. But years later, after

crossing mountains and oceans, each sees approaching him a stranger who proves to be his old companion. But why, after following absolutely opposite directions, they should thus meet, must to their simple minds remain an insoluble paradox—a fact to be accepted but never understood, because they can not comprehend that their “flat” space is insensibly curved, while the curvature involves that the apparently infinite desert space is actually finite. Such gross ignorance naturally amuses us, till we reflect that our own minds occupy exactly the same standpoint with respect to Space-time curvature, as the savage mind does to Earth curvature. For each is confronted by something totally unfamiliar to ordinary experience, and therefore inevitably paradoxical. The average mind projects the surrounding space, which it imagines it fully understands, throughout the entire Universe, thus completely ignoring those complex relations between “pure space,” ether and matter which necessitate Relativity curvature. To object that this statement does not enable us to “understand” such curvature is true, but irrelevant. For it means only that the intricacies of mathematical Physics must here be omitted; but quite similarly no one can “understand” even Earth curvature apart from a close acquaintance with astronomical theories. All such technicalities clearly pertain to experts, and the average mind can never hope to do more than comprehend the main governing principles.

My final illustration will be the simplest of all, but nevertheless the most significant. For it concerns the meaning of Simultaneity and the methods by which this is ordinarily determined.

It is an everyday experience that for observers close to the occurrence, seeing a blow struck is simultaneous with hearing it, while observers at a distance hear it after an interval which increases with their own remoteness. A

precise person would quite logically insist that even the initial simultaneity was only "practical" and not absolute, owing to the time light takes to travel. Ordinarily, however, "practical" simultaneity is sufficient, while elementary Acoustics enables us to reduce all the discrepancies to accurate accordance for both stationary and moving observers.

Now despite the familiarity of these conditions, they exemplify points of fundamental importance. In the first place, the discrepancies are all due to conditions which affect, not the *minds* of the observers, but only their bodies —*i.e.* their positions and velocities. Of course their minds also must be concerned, because they are conscious beings. This has given rise to the widespread delusion that Einstein's Theory is the result of the relation between the human *mind* and Nature, and therefore supports philosophic Subjectivism. But in my illustration the presence or absence of simultaneity obviously depends on the varying positions of the observers' *bodies*, since their minds are active continuously. This holds throughout all Relativity Theory; it is concerned with the relations between the observers' sense-organs and the physical environment,¹ not specifically with their minds; whence it follows that the philosophic issues of Subjectivism remain still open so far as Einstein's Theory is concerned.

The second point is that it is only necessary to substitute the vastness of sidereal space for the limits of everyday to realise that the velocity of light must there play exactly the same *rôle* as that of sound, the only difference arising from the high speed of light. Before considering the main consequences of this, three minor points demand attention: —(a). The velocity of light is great solely as contrasted

¹ More technically, and therefore more correctly, with the reference systems in which observers are situated.

with familiar wave disturbances. For if we could obtain a commanding view of the entire galaxy, we should then see the light rays travelling from star to star apparently as sluggishly as a snail crawling about a large garden, simply because the interstellar distances altogether dwarf even the eleven million miles which light traverses every minute. (b). The corrections necessitated by this velocity have become quite commonplace in connection with actual sunrise and sunset. (c). Reverting to the illustration of stationary and moving observers hearing a sound, it must be noticed that while, by correlating their individual experiences, they could all calculate the actual simultaneity, they would be dealing throughout with the same event (or succession of events), not with subjective and separate impressions. Here again misunderstanding has arisen, owing to seeing and hearing being confused with the observed event. It is plainly only the experiences of individuals that are discrepant; they may hear the sound at very different times, but the actual event (or succession) remains objectively single, and is the common focus of all their correlations; this again remains true when light is substituted for sound. Differently situated observers make mutually discrepant observations peculiar to themselves; but the Theory of Relativity correlates these with reference to events that are not peculiar but common to all; and whether these occur in a remote star or in the core of an atom makes no difference to this general principle.²

One of the most perplexing features of Relativity is the fact that if an accurate clock travels very rapidly away from us, it is observed to lose time at a rate proportional to its velocity, until if it could attain a velocity equal to that of light it would seem to mark the same hour without any

² "The frame of space used by an observer depends only on his motion." Eddington, *The Nature of the Physical World*, p. 14.

change, although its mechanism would continue to function as usual. Conversely, an observer travelling along with the clock³ would find it keeping normal time, while all Earth clocks would appear to him to be losing or—at light velocity—stationary. Paradoxical though this seems at first sight, it is clear that there is already some analogy to the differently conditioned observers of any ordinary impact or explosion. If then we accustom our minds to the swiftly travelling light waves instead of slow sound signals, our perplexity should begin to diminish; and if we now proceed to imagine terrestrial conditions altered a little further, we should readily understand why Relativity phenomena are all perfectly natural.

Let us then picture two observers, A and B, who have been blind from birth, but have become skilled scientific investigators. Since light is quite unknown to them, all their knowledge of simultaneity and succession—*i.e.* of time and waves—must be derived mainly from the sounds they hear. They compute time therefore not by looking at clocks, but by listening to sound signals, and removing discrepancies by an intricate system of theoretical correlation. If they use automatic guns firing every second, suppose they begin by standing together on a station platform, so that the two guns fire synchronously. Thus far, the conditions are quite simple and analogous to our own experience of visible clocks. Now suppose that A boards a swiftly moving train, leaving B on the platform. Then although B will continue to hear his own gun's seconds exactly as before, it is clear that these will no longer synchronise with the signals reaching him from A, who is steadily moving farther and farther away, because each report from A's gun requires additional time to cover the intervening distance to B's ears. Still further, as the train's velocity increases, each report from

³ Technically, situated in the clock's own reference system.

A will have farther to travel than its predecessor had, and will therefore appear to B to be delayed as compared with his own reports, which continue of course to fire normal seconds. In other words, B will hear A's gun-clock go slow as contrasted with his own, while the contrast will become accentuated as the train's motion is accelerated. On the other hand, A's experience must naturally be the direct converse of this; for as the train carries him away, he hears his own clock firing normal seconds while B's gun seems to him to be slowing down more and more. All these occurrences are both simple and natural, even when we complicate the situation by additional blind observers travelling about at varying speeds. If they were ignorant, they would be hopelessly puzzled—exactly as the lay mind has been perplexed by Relativity! On the other hand, Acoustics would enable the blind persons to understand all that happened and so obtain the requisite correlations. Thus if we substitute light for sound, and remember that both alike require time to travel from their source to the sense-organs, the only essential difference being in their respective velocity, we can understand why an ordinary clock travelling away from an observer must appear to him to slow down exactly as A's gun seemed to B to do.

But this means that there are various types of "clock"; and in fact any mechanism whatever that records periodic changes will serve as a "clock"; whence it immediately follows that since many atomic and electronic processes are periodic, they also are infinitesimal "clocks," whose rates of vibration must be affected by any high velocity precisely as was the ordinary clock in the foregoing illustration. To pursue this aspect further involves the technicalities of current Physics and Mathematics; but quite apart from these, it should now be no paradox that the mass of a swiftly travelling particle increases proportionately to its velocity,

and becomes infinite if its velocity equals that of light itself; while mass is so fundamental an attribute that these variations inevitably involve many allied physical phenomena.

It is then no exaggeration to say that Relativity depends on the fact that light, like sound, has a finite velocity. "We have not taken account," observes Einstein, "of the inaccuracy involved by the finiteness of the velocity of light."⁴ In this connection another popular fallacy should be corrected. For it is not the case that the velocity of light is the greatest possible velocity that can ever be actually *attained*; it is only the greatest that can ever be actually *observed* and recorded. Prof. Eddington has given a clear illustration of this;⁵ and though it may, once again, seem paradoxical that this velocity should remain invariable under all possible conditions, this paradox also vanishes as soon as we realise that all our knowledge of natural phenomena is revealed, ultimately, by light signals of various types. Light waves travel from an ordinary clock to our eyes; and quite similarly from the stars and from spectra. Apart from light man would plainly be in the dilemma of the congenitally blind observers previously referred to. Now this means, in the end, that in order to ascertain the velocity of light waves we are absolutely dependent on those very waves themselves. For these are our ultimate signals, which we can not correct by any others whatever. Thus light may be imagined as a celestial page-boy, whose own answer we must accept whenever we ask him how rapidly he travels; actually he invariably gives the same reply, which can be checked in no way at all, since all experiments yield the same result.

At this point it is often asked—"But is this *really* true? Are these perplexing variations in mass and in time inter-

⁴ *The Theory of Relativity*, p. 10.

⁵ *Op. cit.*, p. 56.

vals real, or only apparent? Do they actually occur, or only seem to occur?" The answer turns on the meaning of the terms "really" and "actually." We know the actual, obviously, only through some mode of experience—sense-experience, thought, emotion or otherwise. Now "Reality," in the end, is what human experience, when taken in its entirety and under all conditions, consistently reveals. A dream or a mirage is "unreal" because it is, no matter how, inconsistent with the entirety of human experience; so that failure to detect such inconsistency involves error, illusion or even insanity. To the insane themselves their "world" is intensely real; but it is fatally inconsistent with racial experience and therefore with Reality. Conversely then, the invariable velocity of light must be accepted as "real," and not merely apparent, because it invariably—*i.e.* consistently—results from all scientific experience, both experimentally in direct observation and theoretically in calculation.

This raises a further fundamental feature. In one highly important sense, the relative is what appears to occur, or "seems" to exist; whence it follows that as Reality is discovered, to that degree Relativity diminishes. In this respect the title "Theory of Relativity" is somewhat misleading, since it may easily be understood to exclude absoluteness completely. The truth is however the direct contrary; for one of the principal aims of the Theory is to ascertain as many absolute characteristics of Nature as possible. "It is a common mistake to suppose that Einstein's Theory asserts that everything is relative. There are absolute things in the world";⁶ so that since there are undeniable absolutes for Science, there may be absolutes for Philosophy also.

Similarly with respect to Gravitation. Almost univer-

⁶ Eddington, *op. cit.*, p. 23.

sally the Theory has been taken to disprove the existence of gravitational forces or influences; or still more crudely, to have proved Newton's theory to be erroneous. But this is very far from being the case; Newton's Theory itself is a very close approximation to Einstein's, and under certain conditions identical therewith; and the correction due to Einstein's may be compared to the discovery of a slight error in the annual accounts of a wealthy corporation. The issue here depends on the two types of velocity with which Physics is concerned—as uniform, or accelerated; for whenever acceleration occurs, the phenomena then become indistinguishable from those observable in some gravitational field. This is explicitly recognised by Einstein himself in his use of the term “Principle of *Equivalence*,” which plainly implies that the phenomena due to acceleration are *equivalent* to those due to gravitation; so that while the concept of Gravitation has been profoundly modified, it by no means follows that the existence of Gravitation must be denied. It depends wholly on the standpoint adopted. For the pure mathematician is not directly interested in Gravitation as actually existing in Nature, any more than an accountant is directly concerned with the motives of his clients. Both alike require no more than the mathematical data of their respective calculations.⁷ The pure mathematician may thus be called the accountant of Nature; but when we pass beyond pure Mathematics to Physics, the existence of Gravitation, ether and allied natural entities at once becomes a relevant problem. “This does not mean,” observes Eddington, “that the ether is abolished.”⁸

Similarly as regards the character of Space and Time as such. Relativity is not at all concerned directly with

⁷ “To the mathematician the physical properties of substances which give material representation of an equation are quite irrelevant.” Maccurdy, *Common Principles in Psychology and Physiology*,” p. xiii.

⁸ *Op. cit.*, p. 31.

these, but only with the methods and systems of *measuring* them; that is with "space-time intervals." Again to quote Eddington, when the physicist "speaks of space it is always the inches that he should have in mind."⁹ In recent discussion it has been contended that because the observed intervals must vary with varying reference-systems, therefore Space and Time must in some way be mind-dependent. But here there is obviously a dual confusion—first of space-time intervals with Time and Space themselves, and secondly of reference systems (which are purely physical) with mind as psychical. The latter is plainly fatal, while the former is comparable to confusing the differing national weights and measures with the liquids and metals to which these are applied. A parallel erroneous belief is that the idea of the four-dimensional Space-Time-Continuum implies some incomprehensible transformation of Time into some mysterious kind of Space. The truth is that mathematicians can conceive four-dimensional space, although no human being can ever picture or imagine this. In such space, again, it is possible to construct a timeless schema of temporal processes—of non-temporal world-lines and coordinate systems. But all this is merely an expansion of the long familiar facts that graphs, which are plainly purely spatial, and mathematical and chemical equations, which are obviously timeless, often represent temporal processes. In spite of this, however, Time remains Time and Space, Space, exactly as hitherto; all that is requisite is to avoid the confusion between the four-dimensional Space-Time-Continuum, and four-dimensional Space, which is really like confusing "honest Abe" with the Hebrew patriarch! Likewise as regards Past and Future. These also, for each individual, must be kept mutually distinct, in spite of the fact that events simultaneous for one observer may be

⁹ *Op. cit.*, p. 14.

successive to another who is in a different reference system.¹⁰

Finally, it is often asserted that the new concepts of Matter and Energy or electricity, as being in some manner identical, involve the repudiation of philosophic Materialism. But this again is quite illogical. Even though Matter is a mode of Energy, or atoms composed of electrical particles, still Matter remains physical, and not in any degree psychical or mental; unless of course we begin by presupposing Panpsychism. Apart from this, Matter becomes no more immaterial than before; no more akin, in other words, to consciousness or mind as such. Energy and electricity are no more "spiritual" than cohesion and gravitation; so that the sphere of Nature remains precisely as material, and also as mechanical, as it was before Einstein's Theory was advanced.

¹⁰ Cf. Eddington, *op. cit.*, 37, 48, 58.

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RECENT INTERPRETATIONS OF RELIGION IN GERMAN-SPEAKING COUNTRIES¹

I

IN the broad field cultivated by the sciences and the philosophy of religion, the developments in German-speaking countries during the past two decades have been manifold and fruitful. A number of different influences have conspired to revive anew the interest in its problems. On the one hand, religious thought and life were strongly stimulated and stirred by the events of the war and the revolution, and this inevitably led to important changes in the scientific treatment of religious questions and views. Theology manifested a new form of spiritual struggle, and this was sustained by powerful forces of genuine religious experience. On the other hand, the various sciences, and philosophy as well, were impelled by the very pressure of their own problems to reckon afresh with religion and with its claim to truth.

Now the interpretation which confessional religion gives of itself and the interpretations of the special sciences of religion (starting, respectively, from dogmatically given contents and from empirically given facts) intersect at the crucial question of the nature and truth of re-

¹ This paper, translated from the German by Edward L. Schaub, concerns itself primarily with movements since about 1910. It was solicited by *The Monist* with a view to supplementing the series of *Monist* essays recently brought out by the Open Court Publishing Company as a volume entitled *Philosophy Today*.

ligion. Insofar as this is the case they should be included within the philosophy of religion. For all investigations devoted to the central problems of nature and truth presuppose, either explicitly or implicitly, a philosophical decision respecting the competency of specific methods of attack. Moreover, the philosophy of religion proper must maintain the closest possible connection with all the other sciences of religion. Hence it is advisable, in any survey of the present sort, to draw the circle wide enough to include a consideration of at least those sciences which take the first steps toward a critical interpretation of the traditional ecclesiastical doctrines or of the facts which historical investigation has brought to light concerning the general development of religion. To be sure, we are here compelled to limit ourselves to the literature that is most important, that is, to those publications which in some manner touch the characteristic problems of the philosophy of religion. Now the empirical sciences of religion, especially, are able to restrict their attention to matters of historical fact—to questions concerning the origin and development of religion, and its manifestations in the life of the individual and in the total complex of external culture—and thus to leave aside the question as to the truth to which religion lays claim. Nevertheless, historical, sociological and psychological investigations are disinclined to withhold judgment concerning the nature and the value of religion, and such a judgment may not be reached without an examination of the religious truth which theology asserts and defends. Conversely, theology and the philosophy of religion proper are compelled to familiarize themselves with the results and the reasoning of the empirical sciences and to accord to the latter their proper significance.

The fact of such an interrelationship of problems is

clearly attested by the literature of the subject. Every attempt to disregard it strikes upon insuperable difficulties, whereas the task itself, that is, the interpretation of religion, is directly furthered according as considerations of method receive more conscious and more effective attention.

II

Despite the fact that Max Weber's work remained in part unfinished, the extraordinary achievements of this scholar in the field of sociology make us realize the heavy loss which science suffered through his all too early death. His *Gesammelte Aufsätze zur Religionssoziologie* form a landmark in the history of this science. They contain first of all the famous essay in which are disclosed the connections between the ethics of Protestantism, especially Calvinism, and the rise of the capitalistic spirit in the economic order of the Occident. Supplementing it is a paper relating to the individual sects of Protestantism. The remaining essays are concerned with the manner in which the world religions deal with the ethics of the economic order. Here the author presents his conclusions regarding China, India and the ancient Hebrews, though in this last case his studies remained incomplete. The execution of further plans was denied him. Of high value for the science of religion is his interpolated study, "*Theorie der Stufen und Richtungen religiöser Welt-ablehnung.*"

Weber's work on the Christian ethics of the economic order was supplemented along certain lines by the theologian Ernst Troeltsch, particularly in his *Die Soziallehren der christlichen Kirchen und Gruppen*. Troeltsch here deals with the Christian conception of the community, both by reference to the history of dogma and likewise

systematically. The "sociological structure of Christianity," in his view, is characterized by the fact that in it individualistic and universalistic motifs exist both side by side and intertwined. "The individual may regard himself as of infinite worth." In this wise the individual is rendered absolute. This on the one hand removes all terrestrial and social differences, and on the other adds strong emphasis to the thought of the community, inasmuch as altruistic commands are included among those which the individual must obey if he would attain to personal sanctification. Furthermore, those who seek sanctification for the service of God come together precisely in their common goal, that is in God. "Inasmuch as the conception of God is not that of a passive bliss but that of a creative will, those who are united in God must actively manifest His loving will." "From an absolute individualism there thus springs an equally absolute universalism, both alike possessed of a purely religious basis and securely anchored in the thought of a holy and firm loving will." Succeeding the systematic exposition of these central ideas is a larger section of an historical character. The "social self-development of the religious idea" is here distinguished from its relations to the social creations of the secular order. Troeltsch finds three main types of religious groupings: the *church*, which seeks to incorporate the masses and to adapt itself to the world; *sects*, which unite only strict believers and sunder themselves into small societies; and the *mystic group*, whose formation is along strictly personal lines, if indeed it takes place at all and does not give way to a "relativistic individualism."

Troeltsch's findings did not remain uncontested from the side of sociology and theology. From the standpoint of Roman Catholic presuppositions, for example, they

were subjected to a detailed critique by Otto Schilling in his *Die christlichen Soziallehren*. Schilling utilizes an intensive study of the patristic and scholastic sources in an attempt to invalidate Troeltsch's contentions regarding the sociological tenets of Christianity, their development and influence upon the family, society, and the State. He concludes his book with an eulogy of the social teachings of Thomism, which he regards as the final presentation of Christian principles respecting the fundamental structure of human relations.

Alongside of Weber and Troeltsch, in their sociological investigations, we find a philosopher in the person of Max Scheler. The most important contributions to a sociology of religion which we owe to him personally or to his school are to be found in the second volume of *Schriften des Forschungsinstitutes für Sozialwissenschaften in Köln*. The introductory essay is from Scheler's own pen; later, in 1925, this appeared in an elaborated form as a separate treatise entitled *Wissensform und Gesellschaft*. Of the other contributions mention should especially be made of "*Indische Lebensweise*" by Spindler, "*Soziologie der Mystik*" by Honigsheim, and "*Soziologie des Steiner-Kreises*" by Stein.² Scheler's sociological studies rest upon a deep-going and comprehensive investigation of all spheres of human consciousness; in this he employs the phenomenological method initiated by Husserl and concerned not with psychological laws of genesis and development but with the *a priori* laws of essence. In referring to such methodological considerations, however, we are passing from the circle of sociological concerns into that of the psychology of religion.

² An interesting specific problem is discussed by Joachim Wach in his *Meister und Jünger. Zwei religionssoziologische Betrachtungen*, Leipzig, 1925.

III

The quarrel respecting the methods of psychology and their adequacy to solve questions concerning the nature and truth of religion, had already continued a considerable time before Wilhelm Wundt, shortly prior to the period dealt with in the present survey, brought to completion his great works. In 1911 he published his *Probleme der Völkerpsychologie*; in 1914 and the years following thereupon, the second edition of the volumes on *Mythus and Religion* which form a part of his monumental *Völkerpsychologie*. In view of the fact that the subsequent psychology of religion has devoted much attention to the doctrines of Wundt, it may be well for us at this point briefly to remind ourselves of their essential features. Religion, Wundt tells us, "did not spring from a single root, but from several. Whoever would seek its origin psychologically must endeavor to penetrate into the total complex of the phenomena of religious life and to understand the relations of their separate constituents to one another as well as to other departments of human experience." Now, religion, like the other great mental creations, is not exclusively or primarily the product of the individual mind but is a manifestation of the folk mind. Hence the proper method of its study is to start with an analysis and interpretation of anthropological facts; the goal, however, is the genetic explanation of the nature of religion.

Wundt's psychology of religion includes among its concerns a decision with respect to the question of truth. In contrast thereto Karl Girgensohn's comprehensive work, *Der seelische Aufbau des religiösen Erlebens* (Leipzig, 1921), represents, methodologically, a continuation of the positivistic movement, and holds itself within closer and more modest limits. Girgensohn studied the persons of

his own day. To secure experimentally founded scientific knowledge of them—he considered scientific knowledge impossible without resort to experiments—he undertook to utilize the method developed by Külpe in his psychology of thought. It is impossible, however, to experiment with religion itself without thereby essentially changing it. Hence the object of investigation must be religious experiences artificially aroused through the hearing or reading of religious texts, the observers being required to report their ensuing experiences. Girgensohn's aim was to ascertain not the meaning and content of these experiences but the formal structural elements of the religious life, more particularly the significance of value judgments for religion, the psychological nature of religious certainty, and the nature of religious confidence. The conclusions which he reached after working through a stupendous amount of material are not especially important, particularly inasmuch as his discoveries concerning the "essential elements which no religion may lack" apparently derive in no small measure from the experimental procedure of the particular psychology which he employed.³ The underlying motive of such approaches as utilize the materials of empirical observation is obviously the perfectly natural desire to study religion without preconceptions. All extraneous standards such as that of a fixed theological dogmatics, or a philosophical theory of knowledge and of reality, are to be thrust aside in favor of an unbiased interpretation of the psychological facts. It is with such arguments that Hermann Faber,⁴ for example, champions the standpoint of

³ Other experimental researches in the psychology of religion are: Werner Gruhn, *Das Werterlebnis*, Leipzig, 1924 (continuing the work of T. Haering); Wilhelm Stählin, *Experimentelle Untersuchungen über Sprachpsychologie und Religionspsychologie*, in the initial volume of *Archiv für Religionspsychologie*—a journal edited by Wilhelm Stählin as the organ of the *Gesellschaft für Religionspsychologie*.

⁴ In his *Das Wesen der Religionspsychologie*, Tübingen, 1913.

empiricism, without however defending a merely analytical psychology of elements, that is, an anatomy of the mind. Through his emphasis upon the phenomenological discovery of meaning he separates himself rather widely from the extremely empiristic position of such a writer as Koepp,⁵ who seeks to introduce even into theology the method of "pure observation." He believes that an "empirical-inductive" procedure alone affords us a direct contact with reality, and that the "statistical-historical" and the "logical-dialectical-systematic" methods must be regarded as but "supplementing extensions of the one original path of induction." Hence he makes the demand for an "inductive theology free from all traces of a rationalistic mode of procedure and faced entirely in the direction of reality."

In spite of their polemics against rationalistic modes of thought, the one-sided views just referred to always cloak a good bit of dogmatic intellectualism. Indeed, the path which leads from them to positivism and to other offshoots of the philosophy of the Enlightenment is not a very long one. Fritz Mauthner,⁶ operating with a concept of reality narrowly fashioned by the "understanding," subjects the history of occidental religion to a devastating critique. Devoid of any very deep comprehension of religious problems, he accuses every thinker who entertains religious ideas (especially a faith in God) of intellectual dishonesty or casts upon him the suspicion of hypocrisy. That it is possible to approach these spiritual facts with a deeper understanding and a higher respect, even when regarding religious ideas as fictions or illusions, is shown by the writings of Hans Vaihinger and his followers, as well

⁵ Cf. his *Einführung in das Studium der Religionspsychologie*, Tübingen, 1920; and *Grundlegung zur induktiven Theologie*, Greifswald, 1923.

⁶ In his *Der Atheismus und seine Geschichte im Abendland*, Stuttgart/Berlin, 1920.

as by those of the creator of psychoanalysis, Sigmund Freud.

It was certain passages in Kant that gave Vaihinger the clue that led to his *Philosophie des Als-Ob*. This book, to be sure, antedates the works with which we are here primarily concerned. It still, however, continues to exercise a considerable influence, and this in spite of the fact that, as early as 1919, Heinrich Scholz subjected it to a severe criticism from the standpoint of religious philosophy. Freud, on the other hand (in his *Die Zukunft einer Illusion*) agrees with Vaihinger that the teachings of religion are based on practical "fictions" and that they lack theoretical proofs. He holds, however, that, once their fictitious character has been established, they will not continue to remain acceptable "to persons uninfluenced in their thinking by the arts of philosophy." This difference of opinion between Vaihinger and Freud is due to the fact that they establish in different ways their common doctrine as to the "fictitious" or "illusory" nature of religious beliefs. Vaihinger holds that the practical-religious fiction is inseparable from genuinely ethical conduct; indeed, for him "right conduct is identical with belief in God and in immortality." Freud, on the other hand, believes it possible to remove the religious illusion and to secure for it substitutes that may be rationally established. For, in his view, psychoanalytic interpretation shows that religion represents not "deposits of experience" or "conclusions of thought" but unconscious self-deceptions, "fulfillments of the oldest, strongest and most urgent wishes of mankind." Concerning their truth he wishes to withhold judgment. "As yet our knowledge is too limited to enable us to make a critical approach to them." So long as they are incapable of demonstration, he holds, they may also not be refuted. Such a state of ignorance does not afford the

right to believe; for "scientific effort is for us the only way that can lead to a knowledge of external reality." Nevertheless it is of no little moment to have recognized that the teachings of religion, as respects their psychological nature, are illusions. Though psychoanalysis is only a method of investigation, an impartial instrument incapable of passing on the truth of religion, it nevertheless augments our doubts. Hence Freud thinks it desirable, in the interests of cultural progress, that religion, which possesses all the earmarks of a neurosis, should be superseded by mature scientific knowledge. The psychoanalyst Johann Kinkel⁷ reaches a similar conclusion. According to him "all social manifestations of religion are infantile phenomena that fall exclusively within the scope of social psychology and that derive from the infantile era of the mental development of mankind." He is of the opinion that, even if the psychological motive represented by the religious feeling will never disappear, men will not always continue to react thereto in the original infantile manner and that religion will in consequence cease to be. Thus, as a matter of fact, psychoanalytic interpretations terminate in a negation of religion.

IV

The uncertainty prevailing in the psychology of religion as respects the matter of method, brought on a voluminous literature concerned primarily with basic epistemological and methodological questions. In his *Einleitung in die Religionsphilosophie* (Göttingen, 1918) Paul Gese discussed the various standpoints and methods for investigating the nature of religion. He himself favored the procedure of self-reflection under conditions in which

⁷ See his *Zur Frage der psychologischen Grundlagen und des Ursprungs der Religion*, Leipzig/Wien/Zürich, 1924.

the individual immerses himself in significant religious lives, whether of individuals or of civilizations. This, he held, would yield an intuitive certainty of truth. Thus Gese sought to maintain his distance alike from the speculative and from the empirical method. Joachim Wach,⁸ on the other hand, attempts to offer a new theoretical basis for the empirical investigation of religion, such as may avoid the pitfalls of psychologism. T. K. Oesterreich⁹ likewise starts with epistemological reflections. By these he is led to restrict the task of religious psychology to an analysis of religious life in its typical manifestations, refraining from any judgment respecting the reality claims of religion. Oesterreich's account of the forms and the developmental stages of the religious consciousness offers a suitable and a fruitful basis for the philosophy of religion.

No less cautious than the procedure of Oesterreich is that of Richard Müller-Freienfels in his *Psychologie der Religion*.¹⁰ In this case also the psychological investigations are not designed as more than "perhaps useful preliminary work" for a metaphysical examination and conclusion respecting "the existence of a superior and transcendent world" such as religion affirms. Wilhelm Bruhn,¹¹ on the other hand, energetically seeks to go one step further and, following Frischeisen-Köhler, to discover a point at which the psychical life itself refers beyond the merely subjective. "Egohood," he points out, perdures throughout the change of psychological conditions. Hence

⁸ Cf. his *Religionswissenschaft: Prolegomena zu ihrer wissenschaftstheoretischen Grundlegung*, Leipzig, 1924.

⁹ In his *Einführung in die Religionspsychologie als Grundlage für Religionsphilosophie und Religionsgeschichte*, Berlin, 1917, Cf. also *Die religiöse Erfahrung als philosophisches Problem*, Berlin, 1915.

¹⁰ Vol. I: *Die Entstehung der Religion*; Vol. II: *Mythen und Kulte*, Berlin and Leipzig, 1920.

¹¹ Cf. his *Glauben und Wissen*, Leipzig, 1921, and *Der Vernunftcharakter der Religion*, Leipzig, 1924.

it is a factor independent of the subject and is the basis of all objective reality, including the contents of the religious life.

It was likewise by reference to abiding functions and structures in the nexus of experience that the particular type of psychology which was decisively influenced by Wilhelm Dilthey¹² sought to overcome psychologism and to do justice to the claims of religion. Thus, for example, Eduard Spranger stressed the fact that no psychological phenomenon is intelligible without reference to objectifications of meaning—that we cannot explain and interpret the psychological except through objective spirit. Hence the initial task of psychology is that of comprehending the chief realms of the spirit, especially their structure. The discovery of the nature or essence of such realms in the temporally conditioned and historical forms in which alone they are given to us, is, of course, in turn dependent upon the conditions of “understanding”; for all sides of scientific knowledge are in correlation, just as the mental life itself is an indissoluble unity. “The individual soul must be conceived as a meaningful complex of functions in which various value-interests are related to one another through the unity of self-consciousness.” One of these conceptually independent value-interests is religion. According to Spranger, this consists in the reference of specific experiences to the total meaning of the life of the individual. “The kernel of religiosity must be found in the quest for the highest value of existence.” Admirable as may be Spranger’s description of the form of life and the characteristic mood exhibited by the religious individual, his excessively subjective characterization nevertheless leaves out of account certain essential features of

¹² Dilthey’s collected works (Leipzig, 1925 and following) contain two essays on religion: “*Die geistige Welt*,” in Vol. IV, and “*Der Aufbau der geschichtlichen Welt in den Geisteswissenschaften*,” in Vol. VII.

religion. Even Schleiermacher, of whom there is much in Spranger to remind us, was prevented, by his excessive preoccupation with feeling, from entirely escaping the danger of overlooking that which is peculiar to the religious sphere of meaning.

Schleiermacher's conception of the "feeling of absolute dependence" is unsatisfactory on several counts. Psychologically, its chief defect is that it makes feeling primary and relegates the object, that by which alone the feeling acquires a characteristically religious cast, to the secondary status of a cause reached through inference. In actual religious experience, however, the overpowering impress of the divine is throughout the salient feature. On the basis of this insight Rudolf Otto characterizes the religious feeling more aptly when he refers to it as "creature feeling." His book, *Das Heilige* (Gotha, 16th ed. 1927) carefully analyses this feeling and sharply distinguishes it from all other emotional experiences. In point of method Otto attaches himself to Fries, and in part also to the religious philosophy of William James. As against the genetic and explanatory psychology of Wundt, he defends the thesis that the fundamental concepts of religion are *a priori*. He thinks of the religious *a priori*, of course, in terms not of the transcendental-critical thought of Kant but of the psychological-anthropological standpoint of Fries. Otto seeks to prove that religious phenomena are unique, independent, and underived. His criterion is an intuitive certainty emotional in character and attained through sympathetic understanding and through empathy. In treating the concept of the holy he sets forth in a particularly vivid way its non-rational aspects. The divine for him is "*mysterium tremendum*," "*fascinans*," "*augustum*," the "completely other," before whom the creature quakes and shudders

while yet feeling itself irresistibly attracted. The divine is in all of its aspects more than merely the superlative of the earthly and the human. Hence it is exalted above any words and concepts by which we may seek to express or to define it. Only with extreme inappropriateness may we utilize for its description such analogies of a rational sort as fear, reverence, love, benevolence, omnipotence, etc. These are all but "schematizations" of the non-rational "x" of Otto's doctrine. Otto never tires of adducing new proofs from religious literature and art to confirm this difference in quality and this uniqueness of the "numinous," as he is fond of designating the holy. He seeks to bring the reader himself to an experience of it, quite in line with his hypothesis that man is endowed with religious "divination," that is, an original disposition which alone is competent to pass on the validity of assertions respecting religion. Divination is "the faculty of genuinely cognizing and recognizing the holy in its appearances." Its import is "the glimpse of an Eternal, in and beyond the temporal and penetrating it, the apprehension of a ground and a meaning of things in and beyond the empirical and transcending it."

To be sure, Otto does not satisfactorily clarify the relation of the rational and the non-rational features upon which he insists. Indeed, the two concepts themselves remain shrouded in a certain obscurity. Otto decisively rejects the view that the numinous developed from other elements of experience, whether as a result of intensification or by a process of transformation. "Religion is not in vassalage either to morality or to teleology, 'ethos' or 'telos,' and does not draw its life from postulates. Its non-rational content, no less than its rational, has its own independent roots in the hidden depths of the spirit itself." Nevertheless Otto holds that progress in religion consists

of an harmonization of its two component features, in a synthesis of the non-rational and the rational. "By the continual living activity of its non-rational elements a religion is guarded from passing into 'rationalism.' By being steeped in and saturated with rational elements it is guarded from sinking into fanaticism or mere mysticality, or at least from persisting in these, and is qualified to become a religion for all civilized humanity. The degree in which both rational and non-rational elements are jointly present, united in healthy and lovely harmony, affords a criterion with which to measure the relative rank of religion—and one, too, that is specifically religious." In criticism, Ernst Troeltsch has with justice declared¹³ that these contentions of Otto are not the outcome of a purely psychological analysis but the products of a rationalistically and formally constructed interpretation of history. As a matter of fact, Otto gradually continued more and more to abandon these presuppositions in favor of a purely phenomenological approach.

Along with Otto, George Wobbermin¹⁴ deserves special mention as one who has significantly furthered the philosophy of religion. His chief service consists in having clarified to a considerable degree the problems of methodology. He was decisively influenced by William James, whose great work on religion he translated into German under the title, *Die religiöse Erfahrung in ihrer Mannigfaltigkeit*. Wobbermin sought for a method which would

¹³ In his *Zur Religionsphilosophie. Aus Anlass des Buches von Rudolf Otto über "Das Heilige,"* Breslau, 1917.

¹⁴ Cf. his *Aufgabe und Bedeutung der Religionspsychologie*, 1910; "Die Methoden der religionspsychologischen Arbeit," in Abderhaldens' *Handbuch der biologischen Arbeitsmethoden*, Abt. VI, Teil 6, Heft I, Berlin, 1921; and his chief work *Systematische Theologie nach religionspsychologischer Methode* (1st ed. 1903): I. *Einleitung in die systematische Theologie; Prinzipien- und Methodenlehre im Hinblick auf ihre Geschichte seit Schleiermacher* (2nd ed. 1925); II. *Das Wesen der Religion* (2nd ed. 1925); III. *Wesen und Wahrheit des Christentums* (3rd ed. 1926).

enable psychology both to identify that which is specifically religious and also to furnish the criteria requisite for a decision concerning the truth of religion. The possibility of thus avoiding the Kantian alternative of *quaestio facti* and *quaestio juris* he found in the method which he designates *religionspsychologischer Zirkel*. We should use our own religious experience, we are told, as a key to the understanding of the religious life of others. Having thus sharpened our powers of discerning specifically religious characteristics, we may return with improved understanding to the observation of our own religious consciousness; then we may continue to extend more widely and to develop more intensively and inwardly this process of reciprocal growth in the discernment, understanding and interpretation of the manifestations of the religious life of one's self and of others. It is in this way that we may hope to isolate, in their greatest possible purity, those elements within the historical complexes of religious life which are specifically religious. The conclusions to which this procedure leads Wobbermin correspond at many points with those of Schleiermacher. In his *Wesen und Wahrheit des Christentums*, Wobbermin attacks that difficult problem of the unity of the rational and the non-rational which likewise occupied Otto. He endeavors to show that the severe tensions between the temporal and the eternal, immanence and transcendence, world and superworld which entered into Christian theology did so in consequence of its adherence to the doctrine of an historical revelation.

Martin Dibelius's *Geschichtliche und übergeschichtliche Religion im Christentum* (Göttingen, 1925) is concerned with a distinction which corresponds to that between non-rational content and rational form. Allying himself with Wobbermin, Otto Hofmann published a work,

Der Begriff der religiösen Erfahrung in seiner Bedeutung für die Prinzipienfragen der Religionsphilosophie (Leipzig, 1921). He defines religion as "the living relationship to God," "the inward communication between the ego of man and the Thou of a personality whose activity is experienced as absolutely transcending the powers of man." In view of the fundamental difference between the religious relationship and all other experiences, Hofmann deems it impossible to determine the truth and the reality of the former through the rational means at the command of the human mind. In his essay *Das religiöse Erlebnis: seine Struktur, seine Typen und sein Wahrheitsanspruch*, he attaches himself to Wobbermin, whose ideas he at numerous points supplements and develops. Under the head of empirical sciences of religion in the best sense of the term we may place also Friedrich Heiler's comprehensive monograph, *Das Gebet* (Munich, 4th ed. 1924). As the author makes clear, he here subordinates the critical evaluation of religion to its empirical investigation. His aim is not to determine what must be the true meaning of prayer but, by a scrutiny of the most diverse forms of prayer and their motives, to understand the inner attitude and the spiritual purposes of the man who prays.

V

The literature just discussed more or less closely approximates to the so-called "phenomenological method" first developed by Edmund Husserl in connection with his logical attack upon psychologism. Among his disciples and students none has thus far applied this method more widely to the problems of the science of religion than the lately deceased Max Scheler. As early as in his treatise, *Der Formalismus in der Ethik und die materiale Wertethik*, we find the beginnings of ideas decisive for the philosophy of

religion. Scheler's turn from Kantianism to a Catholicism of an Augustinian cast then appears with entire clearness in his great collection of essays, *Vom Ewigen im Menschen* (Leipzig, 1921). To understand his conversion it is important to know that in his belief the very description of Catholic piety already presupposes the acceptance of Catholic dogma. Otto and Wobbermin maintain that personal religion is indispensable for an interpretation of religious phenomena. Scheler goes further still. In place of mere empathy into foreign acts of faith, he requires that one actually exercise them. Thus one directly grasps the religious object which at the hands of the former method (a method that in the last analysis remains psychologistic) dissolves into a "subjective category of reason." The essential feature of a religious act, according to Scheler, is to be found in the fact that "in its intention it transcends the world," namely, involves the "direct consciousness that by its very nature it may not be satisfied by any finite object belonging to the world or constituting it." Though it may be doubted whether Scheler's criticism does full justice to the real purposes of such thinkers as Otto and Wobbermin, one must nevertheless concede that it discloses fundamental weaknesses in their psychological method. The phenomenological unity of "act-meaning" and "act-object" from the very outset grants to genuine religious experience the reality of God. The "natural knowledge which one directly has of God or at any rate of the divine" thus renders unnecessary the Thomistic and neo-Thomistic doctrine of the mediate knowledge of God.

This contention of Scheler's has met with denial from the side of Catholicism. K. J. Geyser¹⁵ insists that the

¹⁵ Cf. his *Max Schelers Phänomenologie der Religion*, Freiburg i. B., 1924; *Augustin und die phänomenologische Religionsphilosophie der Gegenwart mit besonderer Berücksichtigung Max Schelers*, Münster, 1923; *Intellekt oder Gemüt? Eine philosophische Studie über Rudolf Ottos Buch "Das Heilige,"* Freiburg, i. B., 1921.

phenomenological method leaves "unanswered the most important question of philosophy, namely, that of the existence of the religious object and the dependent question as to the truth of religion." As against Otto, he urges that intuition is "not an exact or scientific means for securing objective and universally valid knowledge." "The powers of the understanding suffice to afford a consciousness of God and to bring one to reverence and to dedicate one's self to Him, indeed even to cause one to quake in holy awe before Him." A similar neo-Thomism is espoused by Georg Wunderle and J. P. Steffes, while Johannes Hessen and Otto Gründler incline toward the Augustinianism represented by Scheler.¹⁶ Gründler, to be sure, distinguishes three different forms of the knowledge of God and assigns the problem of the divine existence to that natural mode of rational "knowledge" which finds its completion in metaphysics.¹⁷ The philosophy of religion proper, he maintains, is concerned with faith as "a supernatural mode of rational knowledge."

Along with Gründler's work, *Religionsphilosophie katholischer Theologie* by Erich Przywara, S. J. deserves careful attention. According to this writer the philosophy of religion is "the scientific reflection on the unity of religiosity and metaphysics as this actually exists in the naive and therefore pre-reflective experience." In the first part

¹⁶ Cf. Wunderle's *Grundzüge der Religionsphilosophie*, 2nd ed. 1924; Steffes' *Religionsphilosophie*, Munich, 1925; Hessen's *Augustinus und seine Bedeutung für die Gegenwart*, Stuttgart, 1924, and *Die Religionsphilosophie des Neukantianismus*, Freiburg i. B., 2nd ed. 1924 Gründler's *Elemente zu einer Religionsphilosophie auf phänomenologischer Grundlage*, Munich, 1922.

¹⁷ Among the many works discussing proofs for the existence of God may be mentioned: Ludwig Faulhaber, *Wissenschaftliche Gotteserkenntnis und Kausalität*, Würzburg, 1922; Bernhard Rosenmöller, *Gott und die Welt der Ideen: Gedanken zu Problemen der metaphysischen Gotteserkenntnis*, Münster, 1923; Andreas Inauen, S. J., *Kantische und scholastische Einschätzung der natürlichen Gotteserkenntnis*, Innsbruck, 1925; Franz Sawicki, *Die Gottesbeweise*, Paderborn, 1926; Friedrich Huhn, *Der Beweis vom Dasein Gottes*, Berlin, 1927; Eugen Rolfes, *Gottesbeweise bei Thomas von Aquin und Aristoteles*, Limburg a/L, 1927.

of his book he examines the attitudes of persons to God and thus comes to distinguish several types of religious-mindedness. Thus he seeks to lead up to an understanding of the fundamental principle of *analogia entis* in which the relation of the creator to the created reaches its true expression. While, to be sure, not all the contents of religion may be inferred from this principle, the latter nevertheless enables us "to understand the given contents as permeated by a single structural principle." The systematic section of Przywara's book also contains a thorough examination of non-Catholic doctrines. Following upon it is an historical account of the different methods that have been employed within Catholicism for establishing the truth of religion.

In his book, *Absolute Stellungnahmen. Eine ontologische Untersuchung über das Wesen der Religion* (Erlangen, 1915), Kurt Stavenhagen banks heavily on the phenomenology of Husserl. A distinction between the cognitive and the attitudinal aspects of an act of faith had been made by Gründler in an earlier work. Stavenhagen now defines religious attitudes as those which incorporate reverence and love in an all-inclusive and supremely exalted form and which therefore deserve to be called absolute attitudes. Robert Winkler¹⁸ likewise adopts Husserl's act-phenomenology but he undertakes to combine this with the transcendental method of Rickert. In so doing he deliberately approximates to Wobbermin's method. He discerns in the latter "a valuable point of departure for all future investigation" directed towards a systematic theology of a philosophic type. In a more recent volume, Wilhelm Koepp,¹⁹ attaching himself to Wobbermin, Winkler, Husserl and Rickert, develops an inductive, realistic meta-

¹⁸ Cf. his *Phänomenologie und Religion*, Tübingen, 1927.

¹⁹ Cf. his *Panagape: Eine Metaphysik des Christentums*, Gütersloh, 1927.

physics. But here again philosophical methods are consciously transformed so as to take into account theological presuppositions and aims.

VI

The religious philosophy of Protestant theology in the main still continues to follow in the paths of Kant, Schleiermacher, and Ritschl. Among those who have striven to build further on the foundations of the Kantian philosophy, special mention belongs to Julius Kaftan. The aim of his book *Philosophie des Protestantismus: Eine Apologetik des evangelischen Glaubens* is to confirm faith—that is, its conceptual form, not its content—through philosophy as “the effort of the human spirit to comprehend itself.” Beginning with a critique of the Kantian epistemology and an analysis of the moral consciousness, Kaftan proceeds to describe religion as “knowledge *sui generis*,” namely, as a “knowledge of the absolute” derived from the certainty of one’s own life. In spite of his appeal to Kant and his renewal of the method of establishing religion on moral foundations, Kaftan comes to results that diverge significantly from those of Kant, especially as concerns the nature of faith and of revelation.

Somewhat closer to Kant is Wilhelm Koppelmann.²⁰ The latter likewise differentiates sharply between the theoretical and the practical reason, and he connects religion with the latter. Koppelmann rejects all non-rational views (such as those of Schleiermacher and Otto) and refuses to separate religion from morality. Christianity, especially, he interprets as a “thorough-goingly rational religion” and “pure moral consciousness.” The specific nature of religion, however, was far more successfully exhibited by

²⁰ Cf. his *Das Wesen des Christentums: Eine religionsphilosophische Untersuchung*, Berlin, 1922.

Rudolf Eucken, whose numerous works freely transformed the philosophy of Kant and developed it into a comprehensive theory of the spiritual life. Eucken on the one hand distinguished between the "universal" and the "characteristic" aspects of religion, that is between religion's attempt to vindicate itself within culture and its tendency to become increasingly internal and thus to transcend culture; the unity and inseparability of these features of religion, he however likewise affirmed. Thus he succeeded in setting forth the autonomy of the religious life more concretely and more aptly than could the systematic formulations of traditional Kantianism and of the Ritschlian school.

The theology and religious philosophy of Protestantism was in turn significantly influenced by that branch of neo-Kantianism which is commonly known as the southwest-German or the Baden school. Its founder was Wilhelm Windelband, the well-known historian of philosophy; its most influential representative is Heinrich Rickert. Windelband's essay on "*Das Heilige*"²¹ takes as its point of departure the antinomy between the "ought" and "being," the normative and the actual, which pervades all the regions of our rational life. Human history ever and again records the courage of individuals who proclaim the demands of "conscience," of "nature," of "God," in opposition to the valuations thitherto universal. Because the criticisms of this "normal consciousness" are of an essentially hyperempirical character Windelband concludes that "conscience" is not a mere expression of the social consciousness but that its sources lie deeper. "In this sense conscience presupposes the metaphysical reality of a normal consciousness—a mode of reality, of course, which

²¹ This is to be found in the collection of essays entitled *Präludien*, 5th ed. 1916. Cf. also Windelband's *Einleitung in die Philosophie*, 3rd ed. 1923. Resembling closely the views of Windelband and Rickert are those of Jonas Cohn in his *Religion und Kulturwerte*, Berlin, 1914.

differs from the empirical. Once we call to mind the validity of absolute values, we realize that conscience is the most certain of all our experiences, and it is precisely in this sense that the normal consciousness is the holy experienced as transcendently real." "Religion is transcendent life; its salient feature is a mode of life that carries us beyond experience, a consciousness of membership in a world of spiritual values, the refusal to content oneself with that which is empirically actual." In Rickert's system of value philosophy likewise, religious values are differentiated as those that "pass beyond the human sphere." Everything human as such proves itself to be imperfect. We may call it imperfect, however, "only on the presupposition of a superhuman value by reference to which man's perfection is judged. Thus the human, as the imperfect, implies the perfect, not indeed as a reality but yet as a valid value." This philosophical conclusion corresponds with the "most universal of the fundamental convictions of religion." Religion, however, does not stop at affirming the "validity" of the holy value but passes on to faith in a "real" good, God, corresponding thereto, because it is only "the superhuman power of this value over reality" that affords a certainty of its realization.

Rickert sharply sunders religion from mysticism. Georg Mehlis,²² on the other hand, thinks of the mystical feeling as the central feature of religion. According to him it is only "in mysticism that the religious phenomenon finds its completion"; it is only in "fusion and unification with a non-rational and divine reality" that the deepest longing of the religious feeling attains its true satisfaction. Of importance is likewise the way in which Mehlis secures an approach to the philosophy of history through his treat-

²² Cf. his *Einführung in ein System der Religionsphilosophie*, Tübingen, 1917; *Die Mystik in der Fülle ihrer Erscheinungen in allen Zeiten und Kulturen*, Munich, 1926; and *Lehrbuch der Geschichtsphilosophie*.

ment of the problem concerning the realization of the valid values. The result is that he incorporates the philosophy of history within religious philosophy. Similar ideas are to be found in Fritz Münch's *Erlebnis und Geltung* (Berlin, 1913).

In its struggle against psychologistic views, Protestant theology linked itself to the critical philosophy of Windelband and Rickert. The latter appeared to render secure a realm of unconditionally valid values. Ernst Troeltsch, the most important of the earlier theologians here in consideration, though according full recognition and appreciation to the psychology of religion in its effort to determine the facts of religion, defended the transcendental method in opposition to the psychology of European and American thinkers. Not at all points, however, did he agree with the school of Windelband. The latter described the "holy" or "divine" as the unitary basis of the normative consciousness but as contributing no essential content thereto. Troeltsch, on the other hand, under the influence of Schleiermacher and Ritschl, reached out for a "religious *a priori*" as an independent and thoroughly original function alongside of or above the other functions of the mind. In describing the content of this rational principle which he asserted as productive of religion, Troeltsch uses the words, "the reference of all that is actual to an absolute substance." This does not carry us far beyond the position of the value philosophy. Troeltsch himself became clearly conscious that such a rational anchoring of religion is unsatisfactory. Hence he subsequently sought another solution which might do fuller justice to religion's claim to transcendence and might bring the formal concept of the absolute into living connection with the concrete wealth of relativistic actualities. This goal could not be reached by the path of empirical and historical knowledge. Thus

the problem of the unity of Idea and revelation, of rational necessity and "contingency," caused the philosophy of history to enter ever more decisively into the focus of Troeltsch's thought. But in this field also he was unable entirely to escape the alternative of dogmatic absolutism or skeptic relativism. Nevertheless his last publications on historicism brought a certain completion to his life's work. As a principle superior to a static system of values ever exposed to the solvents of history, he adopted the concept of a "creative cultural synthesis" which insures a dynamic mastery of antitheses through responsible personal decisions.

In a discussion of Troeltsch's doctrine of the religious *a priori* Robert Jelke²³ contended that Troeltsch did not adequately distinguish between "the rational necessity of forming religious conceptions" and the "proof for the existence of the religious object." Jelke opines that the question of proof may be settled only by reference to a specific revealed religion, that is, to a scriptural theology. In his recent book *Religionsphilosophie* he again seeks to show "that the *a priori* must be understood simply as a purely *formal* capacity whereby man takes hold upon that which is objective and must be supplied by the history of revelation; and that the *a priori* therefore affords no decision respecting the question of religious truth." Thus in Jelke we detect the echoes, beyond Luthardt and Ihmels, of a confessional theology. In the case of Karl Heim, on the other hand, we discover the influences of a biblical theology transmitted through Kähler; and Schlatter, though his chief work, *Glaubensgewissheit*, likewise reflects the thought of Rickert. This book was considerably modified a number of times so as to bring out more sharply its

²³ Cf. his *Das religiöse Apriori und die Aufgabe der Religionsphilosophie: Ein Beitrag zur religionsphilosophischen Position Ernst Troeltschs*, Gütersloh, 1917.

fundamental thesis. The whole of Heim's thought is dominated by the problem of contingency. For him the fundamental character of reality is its incalculability. Everything definite has its source in a decision of a personal will. This is true also of the world as a whole. Its meaning and goal we learn through revelation. But faith in revelation acquires certainty only if one hazards a free decision such as the Christian makes in favor of Jesus Christ.

In his *Religionsphilosophie* Heinrich Scholz likewise contends that the basis of our certainty that religion affords a genuine experience of a divine reality is in the last analysis a "philosophical confession." For the truth of religion may in no wise be demonstrated, inasmuch as it lays claim to establishing a connection with God that transcends all human caprice and is grounded in revelation. It is from the "entirely other," "non-terrestrial" character of its exalted experience that the "self-consciousness of religion draws its conviction that, in the forum of religious philosophy, religion may be justified at most when appealing to the claims of morally earnest thought.

Scholz draws a sharp line between religion on the one hand, and metaphysics and the remaining cultural creations on the other. Thus we are led to a problem which at present occupies theology and the philosophy of religion as does scarcely any other; that as to the relation of religion and culture, or, otherwise put, of "Christianity and idealism." In comparison with it the older problem of faith and knowledge, the problem which grew out of the antinomy between the world-view of natural science and that of religion, has receded quite into the background. True, Arthur Titius made an "attempt at a reconciliation of natural science and theology" in his book, *Natur und Gott*. Quite apart from the extent to which its argument possesses the power of conviction, it did not at all seem to meet

a living issue such as did similar works only a few years ago. K. Dunkmann²⁴ finds in philosophical idealism only "a proof of the inadequacy of human thought, feeling and will." Only religion, he holds, can carry us beyond the opposition of idea and the actualities of nature. Thus, ideas closely resembling those of Windelband are transformed in the direction of a theological dogmatics. W. Lütgert,²⁵ in an historical investigation, also seeks to show that German idealism from the very beginning harbored germs of inner dissolution in that it attempted the impossible synthesis of Hellenism, German mysticism, and the Enlightenment.

The strongest impulse, however, to the battle against idealistic philosophy and the joy in culture exhibited by modern Protestantism came from a theological movement whose historical source was the dialectical philosophy of religion of the Danish thinker Sören Kierkegaard. The ideas to which we refer were given preliminary statement by a number of Swiss theologians, such as Franz Overbeck; after the War they were developed and defended with extreme polemical skill by Karl Barth, Friedrich Gogarten, Eduard Thurneysen and Emil Brunner.²⁶ They are directed primarily against the humanistic phase of Protestant theology, against the anthropological and ro-

²⁴ Cf. his *Idealismus oder Christentum*, Leipzig, 1914; *Metaphysik der Geschichte*, Leipzig, 1914; *Systematische Theologie*: Vol. I, *Religionsphilosophie*, Gütersloh, 1917.

²⁵ Cf. his *Die Religion des deutschen Idealismus und ihr Ende*, Gütersloh, 1925.

²⁶ The following works here require mention: Barth, Karl: *Der Römerbrief*, Munich, 4th ed. 1924. Gogarten, Friedrich: *Illusionen, Eine Auseinandersetzung mit dem Kulturidealismus*, Jena, 1926; *Die religiöse Entscheidung*, Jena, 2nd ed. 1924; *Glaube und Wirklichkeit*, Jena, 1928. Thurneysen, Eduard: *Dostoevski*, Munich, 1922; also Barth and Thurneysen, *Komm, Schöpfer Geist*, a collection of 25 sermons published at Munich in 1924. Brunner, Emil: *Religionsphilosophie evangelischer Theologie*, Munich and Berlin, 1926; *Die Grenzen der Humanität*, Tübingen, 1922; *Erlebnis, Erkenntnis und Glaube*, 3rd ed. Tübingen, 1923; *Die Mystik und das Wort*, Tübingen, 1924.

mantic character which the latter acquired through Schleiermacher and has ever since maintained. Opposing all such attempts to establish religion from the side of man, they stress the Paulinian doctrine of "offence" and of "foolishness," along with Tertullian's *credo, quia absurdum*, Luther's and Calvin's principle of faith, and Kierkegaard's teaching of the "paradox." Religion, it is contended, is not the completion and synthesis of culture, but its antithesis and "crisis," that is, the divine judgment and a radical questioning. For religion, "insofar as it is construed from the side of man makes the claim of bridging from the side of the creature an opposition that is absolute, namely that between creator and creature."

It would be superficial to see in the contentions of the dialectical theology nothing more than intellectualistic exaggeration and ideational construction, and to miss the deep, genuine religious pathos which surges within it as its moving power. Very justly has it been said of these theologians that "their apparent joy in anarchy is born of a keen and honest anxiety regarding religion." "Not God is questionable, but we human beings are so, and most of all so is our religion and our piety from the side of God," we are told by Gogarten.

What revealed to these thinkers the dangers of cultural optimism, historicism, idealism, and relativism, was in an important measure the catastrophe of the War. These movements attempt to reconcile God and the world, the here and the beyond, either through identification or through a relation of continuity. Between the eternal and the temporal, however, there is a chasm which, in the belief of the "crisis" theologians, may be spanned alone from the side of God, through the redeeming word of His revelation. For this reason their philosophy of religion also begins with revelation and with faith therein; it does not simply lead to

them. Brunner describes his philosophy of religion as "a part of Christian theology." "Christian faith does not deny the existence of a certain universal knowledge of God, both religious and philosophical; on the contrary, it presupposes this. What it does deny is that the living personal God may universally be known through the possibilities resident within the world and in the human spirit in general. It contends that the living personal God may be known only through personal experience of Him, through His personal word, through this unique event"—the event, namely, of the divine self-revelation in Jesus Christ.

The theology of crisis continues to be strongly contested. Its effects and countereffects within theological science as such do not here concern us.²⁷ As respects the development of the philosophy of religion proper, it has not been without considerable influence. It has directly attacked those problems which at present are in the focus of all discussions of religion. This is best and most clearly exemplified by Paul Tillich's *Religionsphilosophie*, a book which the author has supplemented by a large number of other publications. After a penetrating critique of all earlier methods of the philosophy of religion, he is led to the "metalogical method" as that which synthesizes and deepens the others. The aim of this method is first of all to overcome the opposition of form and content in order to do justice, in their dialectical relations, to both aspects of concrete experience. It alone seems to be really capable of satisfactorily defining the systematic relation of culture (as "concerned with the conditioned forms and their

²⁷ A brief but admirable exposition of the dialectical theology may be found in Max Strauch's *Die Theologie Karl Barths*, Munich, 2nd ed. 1924. Critical of the movement are: Bernhard Dorries, *Der ferne und der nahe Gott. Eine Auseinandersetzung mit der Theologie Karl Barths*, Gotha, 1927; Erich Schaefer, *Das Geistproblem in der Theologie*, Leipzig, 1924; Rudolf Köhler, *Kritik der Theologie der Krisis*, Berlin, 1926; Kurt Leese, *Der deutsche Idealismus und das Christentum*, Berlin, 1927.

unity") and religion (as "concerned with the unconditioned content of meaning"). They join at the point where they alike stress "unity of meaning"; but even the completed synthesis of the forms of the spirit can be nothing more than a symbol from the standpoint of the absolute ground of meaning. For every "form" would annul the inner infinitude of the ground of meaning; the latter, however, must be inexhaustible. "Only that which is the abyss of meaning can be the ground of meaning. All else hovers at the brink of the abyss of meaninglessness." Thus introducing a "critical paradoxy," Tillich strips the dialectical theology of its barren, supernaturalistic features, and utilizes its fruitful ideas. Though exhibiting a certain approximation to mysticism and numerous similarities to speculative idealism, he sharply sunders himself from them both. He criticises Hegel for having identified the self-complete absolute spirit with God instead of regarding it as merely a symbol for the latter.

VII

Tillich thus opposes himself to all those thinkers who have revived in any form the philosophy of identity. If, however, we would judge the many different attempts within recent German philosophy to pass beyond psychologism and positivism and to develop, in the direction of Fichte, Schelling and Hegel, the critical idealism inspired by Kant, we must inquire who, in the sphere of the philosophy of religion, is really affected by the criticisms of Tillich.

The identification which is scourged must find expression in the fact that philosophy and religion become merged or that religion becomes entirely submerged within a speculative and metaphysical philosophy. In such cases we

may no longer really speak of a philosophy of religion proper; to do so, religion must be granted a certain independence and an inalienable uniqueness, such as Hegel *intended*, at any rate, to give it. Unquestionably this is still the position of Hermann Schwarz's book, *Das Ungegebene* (Tübingen, 1925). Its point of departure is Fichte and German mysticism, especially Eckhart. By a remarkable analogy between the divine and the Cantorian transfinite number " ω " the unbridgeable gulf between God and the creature is strongly emphasized in a manner already indicated by the very subtitle of his later work, *Gott. Jenseits von Theismus und Pantheismus* (Berlin, 1928). Friedrich Brunstäd²⁸ likewise expressly emphasized the unity and interconnectedness of religion and culture, and the tendency of the former to realize values, while he yet, in spite of a certain Hegelian influence, did not deny religion's claims to independence and transcendence. In contrast hereto Arthur Drews,²⁹ a student of E. von Hartmann, formulated a religion of identity distinguishable from that of Hegel only in that it construes human salvation not as the mere consciousness which man may have of his identity with the divine self but solely as man's dedication of himself to the divine. "Substantively, God and man are identical; functionally, however, they are distinct."

This resolution of the religious-metaphysical dualism, which has so often occurred in specifically theological

²⁸ Cf. his *Die Idee der Religion. Prinzipien der Religionsphilosophie*, Halle, 1922. Richard Kroner (*Die Selbstverwirklichung des Geistes*, Tübingen, 1928) likewise objects to Hegel's dissolution of religion into philosophy. For Ludwig Coellen, on the other hand (*Von der Selbstoffenbarung des göttlichen Lebens*, Darmstadt, 1924) philosophy in the era of the immanent world-concept is the form in which the divine spirit comprehends itself as process. William Stern develops his interpretation of religion from the standpoint of a personalistic metaphysics as this is developed in various parts of his *Wertphilosophie*, 1924; reference may be made to *Person und Sache: System des kritischen Personalismus*, Vol. III, Leipzig, 1924.

²⁹ Cf. his *Die Religion als Selbstbewusstsein Gottes*, Jena, 1906.

thought, into a correlation of aspects of the world consciousness or the absolute spirit, finds expression also among representatives of that philosophy of life which has its roots mainly in Nietzsche and Bergson. Most prominent among its representatives is Georg Simmel.³⁰ His book, *Die Religion*, appeared earlier than most of the literature which here concerns us. It later, however, received expansion and elaboration in a number of other stimulating essays. Religion for Simmel is an original movement of the soul, which, like other functions, posits a unique form of objectivity, namely, the transcendent creations of faith. Not in the latter, however, but in the being of the soul itself should we seek the meaning and value of the religious attitude. This attitude, therefore, is independent of the existence of the contents of faith. Hence the future of religion, according to Simmel, depends upon whether or not religion, after thrusting aside the question as to the existence or non-existence of the realities believed in (that is, the "transcendent fact of God in his otherness to the world"), may give its creative energies a new orientation, directed upon the religious nature of the soul itself.

More radical still are the thoughts of Leopold Ziegler.³¹ For him the history of Occidental religions is a record of gods whose forms are born ever anew only to meet their doom. They spring from the irrational depths of the inner man, as external symbols of man's own mysterious nature. They perish through a process of rationalization which deprives them of their content and their value. In a future just now dawning, they will be sacrificed once and for all,

³⁰ Cf. his *Die Religion*, Frankfurt a. M., 2nd ed. 1912; also his essays, "*Die Persönlichkeit Gottes*" and "*Das Problem der religiösen Lage*," Leipzig, 2nd ed. 1919; *Lebensanschauung. Vier metaphysische Kapitel*, Munich, 2nd ed. 1922.

³¹ Cf. his *Vom Gestaltwandel der Götter*, Darmstadt, 3rd ed. 1922, and *Der ewige Buddha*, Darmstadt, 1922.

because they stand in the way of the real urge and meaning of religious life, namely, the self-deification of man. Not alone Ziegler but also Dietrich Heinrich Kerler, Nicolai Hartmann, and Max Scheler in his last works exhibit strong Nietzschean influences, these in the case of Scheler being still fused with the pantheism of a Spinoza and a Hegel.³² Writes Scheler: "Original Being becomes conscious of itself in man. The place of this self-realization, or as we may say self-deification, is man, the human self and the human heart." "For that half childish, half weakly distant relation of man to God as it occurs in the objectifying and therefore separating relations of contemplation, of adoration and of petitional prayer, we substitute the elementary act of the personal outreach of man to God, a self-identification with this spiritual act in all of its phases."

Thus the thinkers just mentioned are antipodal to those espousing the dialectic theology. The two groups look in opposite directions for their solutions of the problem of immanence or transcendence. Their extreme positions cause either the philosophy of religion to be entirely surrendered to theology or religion to be delivered unreservedly into the hands of speculative metaphysics—though Tillich, to be sure, made a resolute and fruitful attempt to avoid this alternative by the aid of a new method of approach. Now the problem of transcendence is obviously connected closely with that of the systematic structure of philosophy as a whole. Hence earnest attention to the latter in constant reference to the former is a necessary task for the philosophy of religion. This was undertaken by the philosophers of the so-called Marburg school. Their leaders were Hermann Cohen and Paul Natorp. The works

³² Cf. Kerler's *Weltwille und Wertwille*, Leipzig, 1925; Hartmann's *Ethik*, Berlin, 1926; Scheler's *Die Stellung des Menschen im Kosmos*, Darmstadt, 1928.

of these writers go back in large measure to an earlier time than now concerns us—particularly so their treatises in the philosophy of religion. We must, however, briefly refer to their essential doctrines inasmuch as these constitute the basis for the final views of these writers and prepared the way for the work of Albert Görland and Ernst Cassirer.

Cohen's first treatment of religious problems occurs in his *Ethik des reinen Willens*. Here he seeks to show that an ethics which follows the transcendental-critical method of Kant, in its aim to be a philosophical doctrine of principles involved in law and political organization, requires the concept of God, not indeed as its basis but yet for its systematic completion. The significance of this concept lies in the fact that it in principle "re-establishes the harmony between our morality and our nature." Cohen's small treatise *Religion und Sittlichkeit* (Berlin, 1907), which appeared three years later, supplements these reflections. But it was only his chief work in the philosophy of religion, *Der Begriff der Religion im System der Philosophie*³³ (Giessen, 1915) that furnished a comprehensive, systematic and assured foundation to religion. The latter can be discovered only as "idea." That is, it must be "created *a priori*"; its source must be in "pure" consciousness as a whole. Thus it becomes a problem whenever one undertakes to erect a systematic philosophical structure. The question as to the place of religion within the system of culture as a whole, is rendered difficult through the fact that cognition, will, and feeling exhaust "the phases of consciousness that create the content of culture." Hence

³³ See also Cohen's *Die Religion der Vernunft aus den Quellen des Judentums*, Leipzig (now Frankfurt a. M.), 1919. Along with Cohen's writings on the subject, Rosenzweig's *Der Stern der Erlösung* (Frankfurt a. M., 1927) forms an interesting and important contribution to the religious philosophy of Judaism.

religion (in contrast with ethics, for example) may not lay claim to independence, but only to "uniqueness." In so contending, however, Cohen goes an important step beyond his earlier position. The uniqueness to which he refers appears clearly in his proof that the God-idea is of essential importance for all members of the system of ideas; the latter have their basis in the unitariness of God. Particularly intimate is the bond between religion and ethics. In ethics the God-idea arises, on the one hand, from the postulate that nature satisfies the conditions for an infinite "progress of human morality," and, on the other, from the inherent need that the God-concept thus reached be expanded in such wise as to take account of the needs of the individual. The religious thought of God imbues man, in his sinful isolation, "with the confidence of his personal emancipation from guilt and penalty, and of his restoration to the tasks of ethical freedom." "Thus the God of forgiveness, of redemption and of reconciliation is not, as it were, a myth, but is a necessary completion of the God of ethics and makes possible that emancipating work of the individual which would lose its meaning were not God endowed with mercy." Throughout, Cohen brings the unitariness of God into correlation with unitariness, whether that of being or that of man in his individuality. Indeed, once we envisage the danger of emotionally engendered pantheism, the psychology of human culture makes it clear that "the real task of religion" is "the saving of the individual," as also that of God. "God also as well as man must be preserved. This is the ultimate meaning of religion."

It is with reference to "the unity of consciousness" and "the basic power of feeling" that Paul Natorp's philosophy of religion must come to terms with that of Cohen. It is feeling with its inner infinitude that Natorp considers the source of religion in the consciousness of man. Feeling is

"the inwardness of the psychical life, the real in-itselfness of the soul," "which precedes and determines the form which one gives to any object." Feeling is always richer and deeper than any particular formulation of objective contents, whether of knowledge, of will, or of imagination. Hence that which religion designates as "the feeling of the infinite" is in truth the "infinity of feeling." This its own richness and limitless plenitude feeling objectifies as "the infinite," and thus it comes into conflict with such other types of objectification as are infinite only in the sense that ever further advance is required. Hence religion must renounce all claims respecting transcendence. Religion may be "retained only insofar as it keeps within the limits of humanity." Only within these limits may it reveal its complete significance for the development of a human culture. It intensifies both the collective consciousness of mankind and man's confidence in his ability to carry through his tasks in the world. Through the emotional experience of the connection of all with all, it likewise brings "subjectivity as such to the most determinate and most significant expression of which it is capable." Here, as Natorp writes in his *Sozialidealismus*, we find "the unconditioned coincidence of the unconditioned individual with the unconditioned universal; in the language of religion the unification of the soul with God, and of God with the soul." This passage, however, is extracted from a work written considerably later than the one from which we quoted above. In this latter work, as in other writings of Natorp's last period, we may detect a firm determination to accord to religion, in a form related to mysticism, a more complete and decisive recognition than the author had previously given it.

The execution of this purpose within the systematic framework of critical idealism was seen to require the

discovery of a *sui generis* factor of consciousness that might serve as a basis for religion. This alone would make it possible to regard religion not merely as a unique orientation within the totality of objective experience but also as a region of experience possessing a value and a type of law all its own. This important step was taken by Albert Görland's *Religionsphilosophie als Wissenschaft aus dem Systemgeiste des kritischen Idealismus* (Berlin and Leipzig, 1922). Görland follows Cohen in rejecting feeling as the original religious phenomenon. This latter must be found in divination, in the meaning which F. H. Jacobi attached to the term *Ahnung*. The concept involves the severe tension between the correlative aspects of religious experience, namely, that transcendence of God which is at once at the opposite pole from the ego and is yet in reciprocal relationship with it. Such a transcendence may not be conceived as absolute. It is a "polar transcendence" of God and the ego, of the ego and God; or, to refer to the Old Testament, that distance of God which is likewise His nearness. It is precisely this "polar transcendence" which, on the one hand, brings religious experience into the closest relation with the other fields of consciousness, so far as concerns systematic and methodic considerations, while it yet, on the other, carries religion so far beyond all other modes of experience that in it the "bounds of humanity" appear to be burst. In this latter quality, to be sure, humanity itself, in its most essential character of limitedness and meaninglessness—as the ego in the loneliness of his "unitariness"—becomes the absolute limit of a new meaning-reference, namely the "divination of God." In another way also Görland connects very closely the problem of transcendence and immanence with that of systematic philosophical construction in general. The transcendence motive is described as the factor con-

stitutive of system as a whole, and "polar transcendence" is said to guarantee the "complete immanence," not of God, but of all experience. Thus the transcendence claim of religion, which at first blush seems hostile to systematic construction, becomes, upon a critical evaluation of its function, the condition of the possibility of religious experience. The latter, in turn, by overcoming the complete accidentality of logical, ethical, and esthetic experience, becomes the decisive factor whereby religion establishes its place within the cultural consciousness as a whole. However, "the philosophy of religion as the fourth member of a system of critical philosophy" never strikes beyond these limits, but maintains itself in a methodical correlation with the special sciences of religion.

In the case of Görland, systematic problems receive the major attention. Ernst Cassirer, on the other hand, whose philosophy of religion, in the narrower sense of the term, is given in the closing chapter of the second volume of his *Philosophie der symbolischen Formen*, also gives broad consideration to historical problems. He presents a rich fund of historical, ethnological and philological facts. These he utilizes in order to differentiate the typical ways in which mythical ideas are formed. His aim is thus to incorporate mythical thinking within the sphere of "mental energies"; in consequence hereof, the inner and the outer, "the ego and the world," become differentiated as the original correlatives within consciousness. A deeper understanding of the myth enables one to draw a new and a sharper line of demarcation between it and religion. "Despite the fact that the *contents* of myth and religion are inextricably interwoven, their *form* is not the same." The uniqueness of the form of the specifically religious consciousness expresses itself in its distinctive attitude towards the pictorial world of the myth. "When religion utilizes sense images and signs as

such, it knows them to be what they are, namely, means of expression which, even when revealing a certain meaning, are nevertheless incompetent to do it justice. They point to this meaning without ever completely grasping or exhausting it."

If, now, we cast a backward glance at the total work of the past decades in the philosophy of religion, we cannot escape the impression, that, in spite of significant contrasts and contradictions even in fundamental matters, all the various currents of thought tend to converge. In a measure this is due to the very laws of thought, but it is none the less to be interpreted also as an expression and as the result of freely formed judgments.

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EMOTION AND PATTERN IN AESTHETIC EXPERIENCE

THERE is a tendency for the terms matter and form to take one another's places in different writers on aesthetics, which is due partly to their inevitable relativity as the determinable and its determination; since, that is, they never exist in their absolute meaning of pure indetermination and pure determinateness. But further there are at least three different senses in which the potentiality of a work of art may be understood, which are often confused. These are 1, its physical matter; 2, its conceptual matter; 3, its emotional matter. I propose to call the first medium or material, the second subject-matter or meaning, and the third content.

Thus we obtain three pairs of derivative distinctions.

1. Material and shape. The actual paints, musical notes, marble, etc., are determinable in an indefinite number of ways; their determination is the particular spatial or temporal shape into which they are got.

2. Subject-matter and treatment. The pre-existing determinable or matter here is mental; it consists of memories, sensations and concepts, whose treatment is their development into a given system or articulation of meanings. Form here, namely, is the way in which the meanings are ordered so as to contrast with and bring out one another.

3. Emotional content and bodily pattern.

Here, since this seems to me to be the aesthetically important sense of the term matter, a fresh beginning has to be made. The artist, then, starts with an emotion; the secret of his energy is precisely that an emotional state of *itself* tends to flow over into some sort of expression. Physiologically an emotion is a state of peculiar bodily tension which of itself flows over into overt movement. But an emotion is also an obstacle to expression, and this too has its well-known physiological description. For an emotional state of sufficient intensity interferes with or completely inhibits the performance of the appropriate movements. It is then a diffused disintegration of the bodily machine, in which its parts as it were assert their independence; a revolt in which the muscles pull one against the other chaotically; it issues in trembling, shuddering, gasping, pallor, sobbing, incoherent cries and so on. Further, left to itself this tension mechanically augments till it reaches the pitch of hysteria or paroxysm. A paroxysm which roughly speaking is always the same, and this is another reason why bare, concentrated emotion is an obstacle to expression, or the communication of exact shades of feeling: for nothing is more like the crisis of a passion than the crisis of another passion.

This bodily tumult may either work itself out through its climax to exhaustion (a process which we feel to be degrading and unlovely, essentially inhuman); or it may find release in some instinctive pattern of movements, or, finally, and this is the case that interests us, it may be appeased by the imposition upon the body of a strongly outlined and deliberate attitude. As Burke pointed out, "to dispose the body in a certain way" is to excite an appropriate change of mental state. Campanella, it appears, claimed that he could discover a man's innermost thoughts by a sufficiently careful imitation, in his own body, of the oth-

er's attitude, gestures, etc. The man who drowns his sorrows in drink does so, Burke says, by "putting his body in a different disposition" in which the undue tension of nerves which is his pain becomes impossible. Now of course to besot oneself with drink is not to create a work of art; but the artist's procedure is in one respect resembling: he too proceeds by altering the "disposition" of his body, only what he does is to impose upon it a complex and expert pattern of motions with the result that the bodily tumult is definitely appeased (not simply postponed till the morning after). The parallel with the sorrow-drowner lies in this, that both he and the artist recognize that their emotions are not to be subdued by a pure effort of will, nor by philosophical reflection and thought, but by cunning, by deliberately altering the posture and disposition of the body itself; beyond this, the parallel ceases. Here, it may be noted, is a practical dualism which all can experience for themselves: certain bodily states, namely states of emotional disintegration cannot be directly met by the mind; we can experience this impotence. But they can be met by imposing on the body some type of motion which is novel, or not directly relevant to the situation, the body integrating or as it were canalizing its diffused activity about this new element of order, this pattern. We experience this too; we are profoundly aware, I imagine, of the childish body we carry about with us, so easily engrossed, so automatically subject to distraction.

We have seen so far the essentially double nature of emotion as a factor in art, namely as the fundamental driving-force, and at the same time as the greatest single obstacle to expression. The way out of this apparent impasse is through the subterfuge above described—that is, I should say through form (understood here as bodily pattern). When namely salvation, release, sublimation, purgation—

or whatever other word you care to use—has been attained, when the bodily forces have re-formed themselves about the nucleus of order let down among them so to speak on the end of a string, the resulting creation or work of art *expresses*, we say, the emotional state whose energy and vitality it has succeeded in capturing. Only there is an important qualification needed to make this language more precise: the work of art expresses not just an emotion, but an emotion which, as we have seen, has been dominated.

We are already in sight of a method of describing the arts, i.e. as one form or another of the dance. Also in sight of a conclusion which is that aesthetic salvation, like other kinds of salvation, is through form alone. But the whole argument so far needs to be repeated at a lower level of intensity than that of the passions and emotions, namely at the level of imagination.

Those who equate "imagination" and "imaginativeness" with aesthetic worth, without ever once inquiring whether the imagination may not be a positive obstacle to be overcome by the artist, as well as being a condition of his creative energy, simply pay themselves with a word. Turn to the traditional French account of imagination as you get it in Montaigne, Descartes, Pascal and Malebranche, and you may find some reason to suspect this "Mistress of Illusion"—Montaigne's "*folle du logis*."

Here we start with the bodily machine relaxed, rather than tense. In the state of idleness, revery or dreaming the body is metaphorically speaking disconnected from the world of real objects and actions, but the machine does not cease to function because thrown out of gear. In Descartes' language, the animal spirits keep coursing around and around the same traces in the brain, deepening and enlarging them. And the conscious correlate of this mechanical repetition is an illusory world of the imagination,

which seems to be more real than the real world itself. Thus Malebranche says the more you imagine a large thing, like a mountain, the larger it gets, till at last it becomes overwhelming. The unrelievedly cheerful world of the faithful Couéite, or the melancholy world inhabited by the victim of persecution mania may be taken as examples of the power of deception latent in the bodily machine. For this purely mechanical repetitive or cyclical process sets up an artificial state of tension, which just like a state of passion tends to overflow into action. To quote Burke again in his admirable "purgation theory," "in this languid and inactive state (of relaxation) the nerves are more liable to the most horrid convulsions than when they are sufficiently braced and strengthened." The truth about art, far from being that it is an "escape from reality through the creation of an imaginary world," is that it is an escape from the monotonous tyranny of imagination (as a function of the "machine") back to the real world through the integrating agency of deliberate bodily patterns.

Dreams and revery are not aesthetic facts, because they are unreal; there is nothing there beyond a more or less "horrid convulsion" of the nerves, that is a diffused, almost disembodied emotional state. Now it is of course because the dreamer takes his dream too seriously that it is an illusion. Namely he takes a vague emotional state to be some indescribable or ineffable meaning. Consider how interesting one's own dreams are (if one was not always forgetting details!) and how tedious those of others. In the endeavour to communicate a dream who shall say that he has not been guilty of dressing it up, claiming to have experienced far more than he can be sure of having experienced? The opium eater with his disappointingly dull dreams is a type. These extravagant and at bottom meaningless fancies mask a mechanical ex-

altation which is unreal in every sense except in the purely physical sense that violence has been done to the body by tearing it out of its normal context of relatedness to the real world. No: dreams, reveries, pure imagination are not even the material of art, for art is fundamentally a social, that is a common product, and the incommunicable, the irremediably subjective is forever excluded from it. The work of art arises, I repeat, when the sterile process of imagination is brought under control, directed, given an objective pattern of ordered motions about which to integrate itself, to actualize itself.

The sufferer from stage fright is your "imaginative," your romantic. The image of the boundless multitude of selves, with himself alone in the setting of their merciless scrutiny, runs its course unchecked in his body, and reduces the whole machine to a pitiable wreck of itself. What reality has this terror, or rather the terrifying image? None. The audience is kindly and attentive. What is he afraid of? Nothing. It is an unformulable, nameless fear. Can one even suppose that he is afraid? That he is feeling a definable emotion? Hardly: the namelessness extends even to what he is supposed to be experiencing, for emotions first become distinguishable when they are expressed in works of art. One might say with some show of truth that fear, anger, love, hate and the other passions would never have been distinguished from one another were it not for the poems and tales and the fiery eloquence of man, his music, his dances, in which these emotions are first expressed, and expressly defined through their own domination and submission to control. Disintegration *qua* disintegration (i. e. not superseded by any reintegration) is always the same melancholy thing. The only real element, namely, in the illusory condition of the victim of stage-fright is the bodily disarray, the tense,

conflicting muscles and nerves, the pounding and tormented heart. Let this serve as an initial reason for distrusting the romantic artist, the man who thinks he can dispense with resisting patterns and artistic forms, who will not measure his private dreams and imaginings against the common social background of fact and expression, who seriously considers his experiences too ineffable to be put into mere words, mere paint or gesture, and in consequence strains these instruments in an attempt to force them to suggest more than they can ever hold. Everyone has his own definition of the word romantic, which is not therefore to be given up as hopeless. I should explain then, that by romantic art I only mean positively bad art of a certain very common sort—that, namely, which in various degrees considers *meaning* to be the exclusive pursuit of art, and is inclined to a studious neglect of formal order the better to suggest some vague and thrilling infinity. Its theorists, from Hutcheson to Keats, I am afraid, are those who have held that “Beauty is truth, truth beauty.”

To sum up the discussion so far, it is in terms of agitation and composure that I would interpret the determinable and its determination in so far as these are taken as the emotional content of a work of art, and the bodily pattern expressing that content. Both are necessary, or rather indispensable, for mere agitation without composure is sterile, and so is a composure which does not compose an agitation; but on the whole, if aesthetic worth varies from work to work, it is in terms of the latter, namely composure, form, or bodily pattern that it varies.

Before going on to this main issue however, the significance of bodily pattern must be examined. An examination namely of the dance may render more precise an account which, as physiological in a general way, may

seem so far to include much that is not art—moral action, for instance, or instinctive reactions, or the drudgery of work.

When I assert that all works of art may be looked at as forms of the dance, I consider this to be true without prejudice to any other such statement, as that all forms of art must be poetical, or approximate to music, or that they are all languages—which I consider to be equally true. That is, the truth of such statements is in their suggestiveness; it is simply a question of the fruitfulness of a point of view.

But the dance is somehow more primitive, or more immediate if you like, than any other art, for the reason that its medium is the body itself. It would be possible to construct a system of the arts as radiating outward from this centre.¹ Thus the arts of mimic and of gesture are obvious offshoots of the dance, first developed within the breeding-ground of tribal ceremony, then practised individually. The arts of representative drawing and formal design again grow out of these naturally, as gestures that leave a trace; a trace which in the first case mimics the forms of objects, and in the second records the bodily pattern or gesture immediately, for its own interest. And so on. All the arts embody, in one medium or another, expertly ordered, rhythmical patterns of muscular contractions; those of the larynx, diaphragm, arms, fingers, etc., and though it is only too easy to lose sight of this origin, nothing in aesthetic theory seems to me to be more important than to keep it constantly in mind.

¹ Cf. Alain, *Système des Beaux Arts*, *Nouvelle Revue Française*. Alain (E. Chartier in reality) however does not trace the dance beyond that group of arts which he terms public, as opposed to solitary arts. My debt to this most penetrating and admirable study is very great, especially in regard to its treatment of the emotions and the imagination; and this paper was undertaken as an attempt to develop in a more thorough, if I fear, pedantic way, certain of the brilliant suggestions there thrown out in the form of aphorisms.

What we are concerned with at this point is not of course any such systematic construction of the arts as has been outlined, but with differentiating as far as possible between aesthetic and other patterns, between what is specifically the dance on the one hand, and utilitarian, instinctive and moral expertness on the other.

The task seems hopeless at first, since rhythm and expert adjustment of the body are required for any successful action whatever. The differentia seem so far vastly too wide. But let us look closer.

The aesthetic pattern of motions (the dance) may be said to differ from work (e. g. typewriting) as giving release to an emotion, and further as being imposed upon the body for its own sake as a pattern. It has, however, an external resemblance to work since it is a pattern of bodily motions which *is* imposed, while in contrast to both work and the dance, an instinctive or a reflex pattern of motions (e. g. flight, which may exhibit a high degree of expertness) *imposes itself*. Like the instinctive pattern, the aesthetic pattern expresses an emotion, and in this respect it is these two terms which agree, in contrast to work: however, even here there is a fundamental difference, since in the aesthetic expression the emotion as we have seen must have been dominated, disappears in the pattern, instead of being heightened by it, or kept at the alert, as in the instinctive pattern. Finally, we have the moral pattern of action, e. g. where I impose on my vocal organs a deliberate pattern of sound other than that which I desire to make, with the result that I do not speak ill of So-and-so behind his back. Moral value, like aesthetic value, is achieved through the control of instinctive and emotional tendencies; but with this difference, that the moral pattern is imposed after the analogy of work, for an ulterior purpose; my hearer's opinion of me, and his

own sense of confidence seem to me to be the chief causes why in the above case I sacrifice the very real *plaisir de la méditation*; whereas the aesthetic pattern is adopted with a view to satisfaction and release in the pattern itself.

It will be seen from all this that the boundary lines between these various categories are not such as to preclude the possibility of a given pattern belonging to more than one of them at once. Thus, e. g., the gymnastic arts, wrestling, rowing, etc., which on the one hand may be utilitarian or even moral exercises, may at the same time be, are, I should say, forms of the dance. A boat race, as a contest with a definite purpose, falls outside the aesthetic sphere. It demands control of the bodily tumult for an end. Yet it is at the same time an immediately beautiful spectacle, and may be such even to the actors. It demands mastery of the fear both of individual and collective disgrace, and in the proud and rhythmic sweep of the oars that fear, already dominated, is expressed. What force drives these boats up the river? Literally, fear; but fear canalized into a collective pattern of motions is already confidence. The romantic, with his incommunicable dreams, his sacred temperament and his facile improvisations is out of place in this dance.

In a like manner the village dance gives release to the passion of love, or perhaps better to the panic fears of shame. It is a sage remark of M. Chartier that its purpose is to submit the first caresses of the young to the proof of public spectacle, for else only amorous frenzy would overcome this natural timidity. For the same reason, he points out, if a savage dance appear indecent to the foreigner he should not say it is an immoral or abandoned dance, but that it is a very strong dance, to be able to permit so much. However, this is to consider the village dance as a moral occurrence, precisely because it is to take into ac-

count the *purpose* of it. It seems to me that for its beauty it is enough to regard this pattern as the expression of emotions which are humanized and controlled in the pattern itself, quite apart from the *use* which the collective wisdom may make of this control.

Or, take the case of politeness which may fall under several categories at once. It may be a mere policy, or a duty, but it is also a fine art, a dance. As such it is the art of exact expression—not that one can avoid overtones in speech attitude and gesture: there is enough of the primitive cry left in the spoken word that we can never hope to make language an instrument of rigorous precision. But these overtones will be intentional in polite behaviour. Thus politeness does not exclude insults. The officer on leave in mufti was assailed by a bellicose gentlewoman for not being at the front, and replied that it was too risky there. Upon which, indignant, she wanted to know if he did not think honour preferable to life. “Madame,” he replied with exquisite politeness, “I imagine you are thinking of your own honour and someone else’s life.”² This is polite, because the precise nature of the implied and suggested images is deliberate; it is all meant. Rudeness, or the poor dance in this kind is any sort of tic, incoherence or lack of coordination which results in expressing less or more than is felt: or it may be the use of a gesture or form of words in the absence of any feeling.

But we are already in the difficult region of the fine arts of speech, and we may go on at once to the main thesis of this paper which is that aesthetic value is always to be estimated in terms of bodily pattern and emotional content, only premising that we are taking the case where it seems most paradoxical to hold this, because aesthetic value is assumed to be of the same fundamental type in *all* the arts;

² Alain, “Mars, on la Guerre Jugée,” *Nouvelle Revue Française*, 1921.

namely, an explanation of the value of the dance which will not fit poetry, music, etc., cannot be *the* explanation. There is not, I think, one beauty of the arts of speech, another of the plastic arts, and so on. But as I say, it seems unnecessarily paradoxical to hold that it is the emotional content expressed in a pattern of sounds that gives its value to a poem, rather than the meaning of the poem.

Now the medium of this art is unquestionably complex. Namely a phrase is at least three distinct things, perhaps four. It is certainly always a particular sound pattern: it is always also what seems the antithesis of this, a universal abstract meaning; it is also usually a meaning or sound pattern with a particular emotional colouring. Finally, it is supposed to be or have an associated particular image or selection of images.

Now to say that you can get no more (but also no less) from a good poem than from a good formal design, or from a dance, shocks us, I suppose, because of what is very like a survival of belief in primitive magic in the form of the romantic view that the poet is concerned with an ideal or supernal Beauty which is at the same time Truth; with the result that the value of poetry is supposed to lie in its commerce with universal meanings. Poetry thus becomes an equivalent, a substitute, even a rival to philosophy. Besides being unintelligible, I believe, this view commits us to an uncomfortable dualism of the arts, for there are arts such as formal design, architecture and music whose success, most people would admit, has nothing whatever to do with logical meanings.

However, the above statement about poetry and formal design only seems disparaging to poetry until you try to improvise a thoroughly good formal design yourself, one that could compete with the creations of Greek, Persian, Moorish or Mexican genius. I have already stated some

of my objections to romanticism. Not even the use of vast and vague words will convince me that the romantic is really feeling so much more than he can say—nor for that matter convince me that he knows what he is feeling at all, if indeed he is feeling, and not just imagining that he feels. There is an education of the emotions through art, just as there is of the intellect through science, or of the will through precept and heroic example. We first come to know what we really feel, our emotions and passions first become human, definite, distinguishable through our experience of the accumulated lore of mankind which we call art. For a work of art, whether it be a poem, or one of the Kutahia patterns, is an emotional state, a mood, a passion, occurring first of all in the body of the artist, then projected out of it, detached it may be and left there for others to learn from. The value to our life as a whole of learning in this way what we really feel, (which would be very little without this education) I shall not discuss: it seems obvious enough, and it would not seem that art needs any apology. But I see no essential difference between the wealth of feeling discoverable in a poem, a formal pattern and an architectural or musical pattern. Try to compete: try to improvise on the piano, or with pencil and paper; it is easy enough to copy, but try to improvise, and you will discover the inner blank of the romantic; you will if you are honest experience for yourself the inexpressiveness of mere imagination, that is of unrestrained motion of the bodily machine. If you like, it expresses nothing, because it might equally well express anything; the romantic takes the obvious step and claims that his ineffable reverie expresses everything, all at once.

But to return to poetry. Why not, it might be said, temper the severity of this account of the poetic art by introducing here the second pair of correlatives, subject-mat-

ter and treatment. Why not admit the pattern or arrangement of the poet's concepts themselves as an element of form? It is true that such a pattern would, as having images or meanings for its terms, necessarily be repugnant to characterization as a form of the dance; one cannot seriously speak of the dance of concepts, but why should we for that reason reject a view which is so widespread? The most popular form of this device is to talk of a pattern of particular *images*, since it is obvious to nearly everyone that the famous "poetic truth" is not abstract and universal truth. Thus Schopenhauer speaks of the way in which the poet arranges his abstract concepts "so that their spheres intersect each other in such a way that none of them can remain in their abstract universality." Or L. A. Reid points out that when Wordsworth calls Duty "Stern daughter of the voice of God" the moralists' abstract concept of "duty" has disappeared, is completely particularized. One might add that even as an image the daughter of a voice is difficult. And this is of course the point, that even admitting the existence of such individual images, which may with good reason be denied, they are thoroughly inseparable from the logical meaning, so that where there is no meaning there cannot even be a picture. Or, in Schopenhauer's terms, the points of intersection of concepts cannot exist unless the spheres are there to intersect, namely the abstract universal meanings in their full extension. If "Stern daughter of the voice of God" is a pattern of particular images, so is "Let OR be the perpendicular from O and let its length be p." We are all familiar with this sort of talk on the part of litterateurs and literary critics; if they had more philosophy and psychology, they would have discovered that the consensus of modern opinion is on the whole against the very existence of these "mental pictures."

If then under this heading we are only entitled to put "concepts and their arrangement," what are we to say of it? Differences of arrangement can only produce "better" work here in the sense of more correct or clearer statements of logical meanings. I believe this to be an extra-aesthetic criterion, namely that a "better" arrangement of subject-matter, since subject-matter can only be abstract concepts, must mean a grammatically or else a logically better arrangement, and nothing else. We are left then with the remaining two characteristics of language: as particular sound patterns (patterns of laryngeal motion) and as emotionally significant. Namely, "stern daughter of the voice of God" is the undoubtedly fine phrase it is because of its sonority and because of its emotional resonances. We are bound to maintain then that the aesthetic worth of poetry is not a function of its meaning; or as I should prefer to put it, that "poetic truth" simply means "emotional truth," in the sense already explained in which a poem is so to speak an emotional norm, something by reference to which we are able actually to *discover* what we feel. It is customary to inveigh against "merely literary emotions"—and rightly, since this is the essential criticism of the insincere or ugly. But no one calls love a literary emotion, and yet in its contemporary form this emotion simply would not exist were it not for art, perhaps in all its forms, certainly as literature. True love then probably means love true to Petrarch, true to Dante, or better true to the collective norm discoverable in modern poetry.

But it is in the nature of the poetic pattern that we are chiefly interested, in poetry as a dance of the muscles. Observe the instructive parallel of painting—say Cézanne painting turnips on a table. This language is incorrect. For his world of visual patterns is as unnamed as the fresh world of a very small child. He is not reflecting upon

turnips, he is not even feeling about them, not even *painting* them. He is feeling an emotion of awe, wonder, or it may be beatitude, and the visual pattern suggested by the actual turnips on the actual table, but growing independently of them under his brush, expresses and at the same time dominates and humanizes this emotion, brings it to order and gives it an object. Namely, neither the pattern nor the emotion can be formulated as meanings, but the pattern completely formulates the emotion.

Now the poet, and this is what makes his case exceptionally hard, starts with a material which is already a work of art, i.e. language. As an immediate work of art *below* the level of logical meanings, the sentence or spoken phrase is a modulation of the primitive cry in an attempt to express shades of emotional content. For the cry, like any other form of the dance is immediately emotionally contagious, and upon the basis of this primary if vague contagiousness, a whole universe of emotional discriminations is capable of being erected. It is only later, in the sophisticated state where the biological value of communication reverses the original order of things that we can speak of the emotional state as *associated with* or *tingeing* the meaning. In origin, that is in childhood, it is the emotional content which gives birth to the meaning. The poet's position then is a delicate one: it is too late to get rid of the logical or scientific meanings of words, and besides that would not be to write poetry but to try to create a new language, a work of art of a different character; but he has nevertheless, using words in their integrity, to run counter to the biological current, to produce the conviction that language is not a system of universal meanings with overtones of emotional content, but a system of emotional contents with overtones of logical meaning. He has to get back to the primitive cry, to make everything depend upon a sound-pattern, and

yet he is unable to do so since the logical meanings of words are so firmly crystallized. Thus I do not think it is really ushering meaning in again at the back door to say that the emotional content of the word "God" in Wordsworth's phrase is one of the conditions of its sonority.

Normally of course we hear universal conceptual meanings, not phrases at all, just as normally we do not see the coloured pattern of our visual field, but biological meanings as a field of self-identical (i.e. fixed, conceptual,) objects in a traversable space. The transformation of the spoken word in poetry is similar to the transformation of a sheet of your own handwriting if you hold it up against the light, wrong side foremost. Normally, that is on the right side, you never *see* what you have written except where its defects make you doubtful as to your own meaning. But turn it over. There are no longer any defects, since there is no longer any logical meaning. You now see what you have done for the first time, as a pure pattern, and you will be astonished at its curt and incisive stylization, or its harmonious rhythmical flow, or other inimitable graces, I mean features which you literally could not reproduce by deliberate copying. But these excellences are not merely formal. Or, though there is no meaning to the pattern, there is a content. For it does express what you might call the writer's normal emotional composition. It is the dance of his hand and arm. *Le style c'est l'homme* here too, or if one may be guilty of a play of words which gives an exact contemporary rendering of the word "style" in its ancient sense, "*le stylo c'est l'homme.*" Some degree of "education of the emotions" would be possible even if the only works of art we possessed were specimens of handwriting.

This example must be pursued even further. For the danger of emphasizing the dance-pattern as has been done here, is to suggest an equation of aesthetic value directly

with that expertness, finish and incursiveness which are an undoubted technical condition of value, that is to express it in terms of our first pair of correlatives, material and shape alone. My contention is that the mere shape of a line, or a word, (its spatial and temporal characteristics) taken as the shape of a certain material will never get you past that sort of formalism which is undoubtedly sterile. It is only when you put this shape back in the organism as a dance-pattern, when it becomes the shape, if you like, of an emotion that formalism begins to explain anything or to have any practical value for the artist. Mere skill, which is all that the first type of formalism can give you, lacks the essential correlation with emotion. The cold flourishes of the copper-plate writing-master are not worth turning over to see what they express, because they express nothing. This man is rude with the rudeness of the man who uses the forms of politeness to cover an absence of feeling; whereas the man who writes illegibly is rude in the sense of neglecting the objective forms of social communication in favour of some unrestrained emotional idiosyncrasy.

The poet then has as it were to produce a sheet of his handwriting such that you can see both sides of it at once; or perhaps it is an opaque sheet which permits him to use only one side, the meaning side, onto which he must somehow get the pattern side. Namely a poem is a pattern of sounds one of whose conditions is that it should have a meaning. But paradoxically the meaning does not enter into the poem as a meaning. To get back to the primary work of art, or language as directly contagious of emotional content, is the poet's object; and the system of meanings is an auxiliary, in the mathematical sense of a series of elements introduced for the purpose of attaining an object, but eliminated in the result.

The poem must have *some* meaning. For this reason

Dadaism was a failure. It attempted a poetry of pure sound-patterns devoid of logical meaning, and the result was extremely poverty stricken in emotional content. They did not see that under the impression that they were trying to write poetry they were really trying to create a new language, that they were confusing two quite distinct arts. The only Dadaists of genius are those remote ancestors, those contemporary scavengers, maids, sailors and so on, who create our language.

But the Dadaists were right in feeling that poetry must deal in sound-patterns which directly carry an emotional contagion from one mind to another, and that this takes place somewhere below the level of meanings. For what could be at once more satisfactory as meaning, and emotionally more aseptic than a line such as "Oh, joy, joy, joy"? They were however wrong in attempting to reach this infectious freshness of sound through throttling all meanings. The true poet must use the integral word. His choice is limited by the creations of a first line of artists in another art, he has to acquiesce in their work and his own work starts with such acquiescence. His task is to utilize integral words and phrases in such a way that their universal meaning eliminates itself, just as, in the final result, Cézanne eliminates the turnips and leaves you face to face with a human emotion expressed in a pattern for which there is no verbal or conceptual, but only a bodily transcription. In ordinary life the sound-patterns "daughter" and "God" have become their own names, that is the sound-pattern is no longer heard, it is swallowed up in the meaning. But the sound-pattern "stern daughter of the voice of God" has no name; that is, the meaning of the words is reabsorbed into the pattern. As poetry it exists below the level of words (= meanings) in the same way as the patterns traced by the body of a dancer.

To resume these points then, a poem must have meaning, because meaning helps to specify emotional content; but meaning must also be got rid of, its only function is its reference backward to the primitive work of art, the language or systematized cry, in which meaning is still only latent. Meaning cannot enter the poem as such simply because meaning is always inevitably connected with demonstration and proof, is *relative* to these, and the work of art must produce conviction without proof, by direct contagion; must in fact be incapable of proof. It is then not in terms of meaning that the value of a poem varies; but, like any other work of art whatsoever, directly in terms of formal pattern, and indirectly in terms of emotional content.

In conclusion, it will be asked how can you justify the critical estimate of a work of art on the basis of its formal (bodily) pattern; what makes a good form good, and a better one better than a good one? The answer is the respectable if disappointing one that aesthetics is not a deductive science. There is a theory of aesthetics, namely of what in general are the contributory factors of aesthetic value and how they are distributed. There is also an empirical classification of works of art as to their relative merit, which is capable of reaching a very high degree of certainty. For instance it is as certain to me (if not as clear) that Bach's Matthew Passion is better than Rossini's William Tell, as that ten is greater than five.

But as a pattern whose content must be *felt*, rather than cognized, there is, as has been just said, no demonstrating a work of art. If it were possible to *prove* that one form is better than another and to explain *why*, it would be theoretically possible to lay down the rules for making good pictures and dramas with as much precision as the rules for building a sound bridge. A science of aesthetics in this

sense is as impossible as a science of ethics which would tell you just what to do in every contingency of life. Even to name a dance-pattern is to denature it, to remove it from the sphere of felt values to that of practical meanings. It becomes at once a commercial recipe like the egg-and-dart pattern, an archaeological item like the Greek key and swastika, a scholastic instrument like the anapaest and dactyl, etc. Aesthetically each of these is merely the notation for a dance which you yourself must perform before you can know what it is about, a dance which cannot be judged from the outside, but can on the contrary be judged excellently from within, when it is lived through.

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AESTHETIC EXPERIENCE IN PICTORIAL ART

IN looking at pictures, two different, important reactions are possible. Most experiences are mixtures of both, but one or the other usually predominates. The first I shall provisionally describe, without intending to define, as a reaction to visual sense-objects as such. Thus, for example, I might say "What effective contrasts are gained in this picture by the spacing of the lights and shadows" or "That octagonal figure looks very well on that rectangular base." The second kind of experience is a reaction to visual sense-objects, not as such, but as having meaning. Meaning may be conveyed either by representation or by symbolisation. Thus, for example, I look at a picture and say, "What I like about that is the expression on the man's face," or "What a beautiful representation of Love Triumphant!" If I habitually react in this way I may sometimes assume a very puzzled expression and exclaim "Now, what on earth does that mean?"

The first kind of reaction—the reaction to visual-objects as such—undoubtedly exists. Indeed every work of visual art can arouse it, whereas this is not true of reaction to meaning, for some works of art are neither representative nor symbolical, and these include not merely modern pictures but also Chinese vases and Persian rugs. I shall call the reaction to visual objects as such, the "aesthetic experience," thereby using the term not in the wider sense in

which it is used for almost any mental reaction which a work of art may cause, but in the narrower sense in which it is used for one specific kind of reaction.

In this article I shall first discuss the possibility of co-operation between the experience of meaning and aesthetic experience. By "co-operation" I shall mean the union of both experiences in such a way that each either augments or at least does not detract from the value of the other. Secondly, I shall examine the constituents of aesthetic experience. I shall assume throughout that visual objects—as we may call the objective elements of aesthetic experience—can be graded in value. Some pictures are better than others because the coloured shapes of which they are composed are either more valuable in themselves or capable of arousing a more valuable reaction in a spectator. What we mean by calling them more valuable and to what characteristics their greater value is due are points which will not be considered. The latter, I would say in passing, is probably the most important question for the aesthetics of pictorial art, though there is perhaps none about which less is known.

I

In discussing the possibility of co-operation, one may distinguish between concrete and abstract meaning. A picture may represent, and be known to represent, a number of statesmen at the signing of a Treaty, or a young man judging which of three women is the most beautiful. In both these cases the meaning is concrete. It is still more concrete if it be known that the treaty is the Treaty of Versailles and the minister on the right Mr. Lloyd George, or that the young man is Paris and the three women the goddesses Aphrodite, Athene and Hera. We are aware of concrete meaning when we are aware of a picture as

representing, for example, an anecdote, a historical event or a symbolical situation. A picture, however, may simply represent a man sitting in a chair; or I may be aware of a picture as representing men and a landscape, without being aware that it represents the dedication of the sons of Zebediah. These are examples of abstract meaning.¹

The distinction between concrete and abstract meaning is relevant because the more abstract the meaning the less weighty are the objections to co-operation. The objections actually brought against co-operation are usually based on the consideration of concrete meaning alone—as in Mr. Roger Fry's illuminating discussion.²

In any case co-operation can be achieved only when the reaction to meaning and the reaction to visual objects harmonize in their nature and value. Thus there can be no co-operation if the visual object suggests calm and serenity and the meaning is one of violence and force. Nor can there be co-operation if the visual object possesses a very high value while the meaning is crude. Such discord between the visual factor and the meaning is often found. One may be lost in pleasant aesthetic contemplation of a picture and then suddenly realise that it has some disturbing allegorical significance. The shock is about as great as if someone were to point out a fly crawling along the frame. Often the nature of the visual object is quite discrepant with that of the allegory or anecdote, and there is an infinite distance between their values. In such cases it is fortunate that one can ignore the meaning.

We may consider four objections to co-operation. (i) The first arises from the fact that the representative ca-

¹ It should be noted that in contemplating a picture which is capable of conveying a very concrete meaning, we may be aware only of a vague or abstract meaning. It is only apprehended meaning that I am considering here.

² See his essay on "Some Questions in Esthetics" in his *Transformations*. (London, Chatto and Windus, 1926.)

capacity of pictures is limited, not in faithfulness or "truth to nature," but in refinement. The value of a verbal narrative is not due entirely to its precision; it also depends on all sorts of other qualities like profundity, terseness and elegance. Can pictorial art claim this type of excellence? Only very rarely, if at all, in representations of narrative. These may excite great interest, they may excite strong emotions. But our experience is more like that called forth by Miss Marie Corelli than that aroused by Tolstoy. One reason for this may be found in the fact that the control exercised by pictorial representation is far weaker than verbal control. The spectator is simply led to indulge his own fancy, which is more likely to be lively than profound; and the crudity of the experience prevents its co-operation with that of a valuable visual object. This applies to any pictorial representation of events. But a representation can be fairly concrete and yet not crude—as, for example, in character study and caricature. Here the experience of meaning can be both concrete and valuable; but, even so, if the arguments which follow are sound, it is unlikely to co-operate with an aesthetic experience.

(ii) Emotions also can be described as concrete or abstract, according as they are attached to a specific situation or are relatively vague and unattached. The latter are emotional moods rather than emotions, and it is only they that are concordant with aesthetic experience. Every concrete emotion is discordant—whether it be the spiritual experience of a believer before a representation of the Annunciation or the morbid curiosity of a sensation-hunter before a represented execution. Since the experience of concrete meanings tends to excite concrete emotions, this is another reason against its co-operation with aesthetic experience.

(iii) There may easily be a discrepancy between the needs of meaning and those of aesthetic experience. Thus, for example, the representation of what is psychologically correct may conflict with the aesthetic demands of the visual object. It may be thought that this fact merely sets a problem which the great artist solves. But, though the problem can be solved, it is unnecessary that it always should be. Aesthetic experience is quite important enough in itself to warrant a disregard of extraneous demands.

(iv) Finally, the amount of attention needed for the adequate appreciation of a valuable visual object is greater than is usually recognized. There is a tendency to treat pictures, in their visual aspect, as if they were merely decorative illustrations, and to consider that the differences between them lie chiefly in their meaning. But while an illustration, as a visual object, can be grasped very quickly, the visual elements in a great picture demand an analytic attention as exacting in its way as that which is necessary to solve an intricate problem. Hence attention to a complicated meaning is simply a diverting influence.

It is easy to see that these four objections do not apply to abstract meaning. (i) An abstract representation lacks intrinsic value; but it also lacks crudity. While the absence of the latter is an advantage, the absence of the former need not be a disadvantage. The more abstract the meaning the less positive value it need possess in order to co-operate with a valuable aesthetic experience. It simply reinforces and supplements the experience derived from the visual object. (ii) An abstract meaning naturally excites vague emotions. (iii) The more abstract the meaning, the less are its claims as a representation; hence they are less difficult to reconcile with those of the visual object. (iv) Finally, an abstract representation clearly demands little effort of attention.

My conclusion, then, is that there is no obstacle to co-operation between an experience of abstract meaning and an aesthetic experience. Moreover, almost invariably, it is only in so far as an experience of meaning produces emotional moods, as distinct from emotions, that it can co-operate with aesthetic experience. Suppose we are looking at Donatello's "Youthful John the Baptist," in the Kaiser-Friedrich Museum, which expresses prophetic zeal and energy. If we are to have an experience of meaning which will co-operate with an aesthetic experience, we must not relate the zeal and energy to incidents in John the Baptist's history, nor even definitely to John the Baptist himself; we must simply experience them as we might experience the serenity of a peaceful evening by a deserted sea.

II

I turn now to my second object—a description of aesthetic experience. Mr. Roger Fry describes it as "a reaction to a relation, and not to sensations or objects or persons or events."³ Following his lead, I shall describe it as the perception of volumes and colours as related to each other, together with the resulting reaction.⁴ The reaction of course partly consists of satisfaction or dissatisfaction, these terms being used to cover so wide a range of conscious states that satisfaction, for example, will comprise both mild approval and ecstatic joy. But the perception of related volumes and colours can also excite other emotional and sensory experiences without the mediation of the cognition of meaning. Past experience may play an essential part, but present cognition of meaning does not. I take some at least of the emotional and sensory experiences so

³ *Op. cit.*, p. 3.

⁴ I believe, however, that it is also a reaction to "sensations," for it is a reaction to a complex composed of terms as well as relations.

aroused to be constituents of aesthetic experience. These may be briefly described.

(i) *Emotional Moods*. We may feel mournful because we are looking at a representation of a death, but also simply because we are looking at colours which are dark. Emotions aroused without the mediation of meaning are of the vague, unattached kind already referred to as emotional moods. They are like the emotional experiences aroused by an abstract meaning—like the experience of zeal and energy excited by the bust previously considered. The meaning and the visual object excite experiences of the same type. Thus, when Mr. Roger Fry describes a picture of a landscape⁵ as having “lyrical, contemplative charm,”⁶ he is indicating an experience of this kind. “Lyrical, contemplative charm” clearly signifies an emotional mood, and the experience of abstract meaning—the cognition of the landscape—co-operates with the visual object to produce it. Emotional moods play an important part in Mr. Roger Fry’s aesthetic criticism. Thus, for example, “grave impressiveness,” “richness” and “rollicking self-confidence”⁷ are emotional moods said to be produced by certain pictures. Comparing Fra Bartolomeo’s two pictures of “The Marriage of Saint Catherine,” he points out that “by a different choice of proportions, by a different ‘tempo’ in the rhythm and by a difference in the number and size of the main volumes as revealed by the incidence of the light, a completely different mood is imposed on the spectator.” And he contrasts “the severity of the Louvre picture” with “the mood of almost jubilant delight” evoked by the picture in the Pitti.⁸

⁵ Fra Bartolomeo’s “Adam and Eve” in the Johnson Collection, Philadelphia.

⁶ *Op. cit.*, p. 90.

⁷ *Op. cit.*, pp. 91, 92, 75.

⁸ *Op. cit.*, p. 88.

(ii) *Cutaneous Experiences*. These, too, may form part of our reaction to the visual object. Thus, for example, Mr. Roger Fry refers to "hot, greenish blues"⁹ and "the warm luminosity of sky and distance."¹⁰

(iii) *Kinaesthetic Experiences*. Here, as above, I purposely use no more determinate term than "experience," because it is so difficult to find the correct one. Are these experiences sensations, images or neither? Certainly they are intimately related, in the one case to cutaneous, in the other to kinaesthetic, sensations. Moreover, the term "kinaesthetic" is here used in a wide sense to cover experiences of rest and tension as well as of movement. These experiences are very important, and we can get evidence of their importance from two sources. (a) First, there are the terms used in aesthetic criticism. Thus "balance" is one of the most important critical terms from the aesthetic point of view, and it clearly has kinaesthetic reference. Again one talks of "flowing lines," of "solid masses," and so on. It is indeed surprising to find how few of the terms applied to lines and volumes have no kinaesthetic reference. Mr. Roger Fry's criticisms will again afford good examples. He is one of the few critics who analyse the visual object, as distinct from its meaning, and therefore the frequency of kinaesthetic terms in his criticisms is clearly very significant. He uses "flowing" and "solid" again and again, as, for example, when he says that "the linear rhythm of Chinese Art is peculiarly continuous and flowing,"¹¹ and that "almost imperceptible changes of colour build up for us solid volumes."¹² Among his other kinaesthetic descriptions are "weight and density

⁹ *Op. cit.*, p. 93.

¹⁰ *Op. cit.*, p. 92.

¹¹ *Op. cit.*, p. 73.

¹² *Op. cit.*, p. 194.

of colour," "heavy crimsons," "a rigidly straight line," "tight, mechanical elegance,"¹³ and "firmness and weight of the base." (b) Secondly, if we introspect, we can see that it is through their kinaesthetic character that lines and volumes affect us. Some pictures obviously excite a feeling of movement. Others obviously excite a static feeling. And even when the kinaesthetic appeal is not obvious, it is not difficult to find. Thus the critical terms are not mere metaphors, but are based on actual kinaesthetic experiences.

Emotional moods and kinaesthetic experiences usually form part of our reaction to the visual object, and are therefore usually constituents of aesthetic experience. But they do not merely co-operate as parts of the same whole with satisfaction or dissatisfaction. When, for example, kinaesthetic experiences occur in aesthetic experience, the satisfaction or dissatisfaction which we feel is actually dependent on them. If the kinaesthetic experiences were not there, the visual object would not give the hedonic tone which it does give. It is because we perceive lines as "flowing," volumes as "solid," and so on, that we are pleased. Indeed, when we consider the frequency and importance of kinaesthetic descriptions of the visual object, it becomes plausible to believe that most of our aesthetic experiences are dependent on them, even that we have none which is not. I would even go a step further and say that aesthetic approval is dependent on kinaesthetic satisfaction. But, though kinaesthetic satisfaction may be a necessary condition of our aesthetic approval, it is not a sufficient condition. It produces aesthetic approval only when it is aroused by the perception of lines and volumes as related.

¹³ *Op. cit.*, pp. 93, 74, 71.

Emotional moods can thus be excited both by abstract meaning and by the visual object. In the former case, they may co-operate with aesthetic experience; in the latter case, they are constituents of it. Further, when emotional moods or kinaesthetic experiences occur as results of perceiving the visual object, they are not merely constituents of aesthetic experience, but our satisfaction or dissatisfaction is dependent on them.

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SCIENCE AND TRAGEDY

TRAGEDIES arise out of disruptive contradictions inherent in morals. It is such unavoidable contradictions and not the intrigues of a villain that bring the play to its tragic conclusions. To the Greeks all the characters in for instance the *Antigone* of Sophocles, seemed deserving of sympathy, for all are fatally true to some Greek ideal of integrity and virtue. And if evil and villainy rest anywhere it is not in man but in the world that has made such conflict of the good inevitable. Tragedy is the vain struggle of human good against a cosmic evil.

Obviously, these human ideals and emotions must be invested with a dignity and nobility commensurate with so vast an antagonist, else the conflict becomes mean and ridiculous. In the tragedies of Aeschylus and Sophocles this dignity finds an outward expression in the divinity and majesty of their characters. To depart from this external rank and splendor marks for some critics a departure from tragedy. So Nietzsche mourned the death of tragedy in the plebeian hands of Euripides. But this essential dignity rested on no traffic with the gods. It was no luster reflected by the grandeur and supernal powers of kings and divinities, but well founded in Greek concepts of human excellence. For these tragedies celebrated not pomp and circumstance but Greek virtue.

Some critics recall with regret that in that golden age

nature and the gods took a neighborly interest in man. Man held himself in importance and esteem, and so tragedies were not merely read but written. Even Shakespeare could feel this ancient sense of human dignity. But today man is seen to be what he really is: a petty, unimportant animal with a mean past and no future. Instead of love he has a libido; instead of will, conditioned reflexes. The gods have forsaken him and left him desolate in the mathematico-mechanical universe of physics.

For these critics science has somehow destroyed human values. Our ideals are not found in the quantitative realities of science, so with more courage than insight they are renounced as illusions. The tragic faith is dead. Poetry can no longer sing the grandeur of human conflicts, for science having destroyed that grandeur, the song has become empty gesture and bombast.

But a more competent interpretation of the methods and facts of science will show no such opposition to the tragic spirit. Science does indeed depict a world from which values of good and beauty are absent. Uniform elements in motion within an abstract mathematical structure are not the themes of ethics or of art. But neither are they the only realities.

Scientific theories are not inspired revelations any more than scientists are mystics. The concepts of science are intellectual devices for the solution of problems of a definite kind. They are not exhaustive statements or descriptions of reality. In using these concepts science restricts the extent of their applicability. For the categories of science would be as inapplicable to art as those of art are to science. Whether scientific objects, such as electrons, electric fields, and sensations are real or not is an ambiguous metaphysical question with which the scientist is not concerned. He is satisfied to find them adequate as tools of explanation, dis-

covery and invention. Other human enterprises may require different concepts which may have an equal claim to reality.

That esthetic or moral values find no place in the physical universe does not discredit those values but rather impugnes the adequacy of science. For while there is a compelling logic in scientific thought that hides its partiality, still the field of experience is obviously larger than the domain of science, and just as real.

To express and interpret that experience is the function of art and science. Both find their fulfillment and justification in enlarging human vistas and refining human sensibilities. Art as well as science expresses genuine realities, but by different abstractions and more concrete metaphors. Art presupposes the world of science and in the uniform and monotonous structure that science develops, art echoes a human accent and emphasis.

In a sense the entire human drama, like its natural scene, is the aimless shifting of matter. The difference between so describing it in terms of science and in those of morals or esthetics is, however, merely a difference of context. Considered in one aspect material forces disclose a mechanism, the ways and operation of nature. In another context they are characterized by their direction and efficacy. By stressing the first, we reveal the structure and habits of nature. By examining the second, we discover the values in things. Values are born of the natural forces whose functions and utility they express.

It is this legitimate parentage that assures human values their claim to reality. Moral values are inevitable selections which a conscious active organism makes between those things which minister to desires and those which hinder them. These selections are felt existences and empirical facts. They are not illusions with which man col-

ors an inhuman and indifferent reality. And it is with these real values that tragedy and moral philosophy deal.

A philosophy that denies these values their reality curiously ignores our most vivid and common experience. But it is just as groundless to say that science has shown them to be somehow unimportant and by so demeaning them has made the tragic attitude irreconcilable with modern intellectual temper. For an honest inventory of the forces of nature would not neglect those confused impulses and emotions which are expressed in moral values. And while a just appraisal would declare them trivial on nature's account, they must be allowed their true estimate in human economy. No philosophy can ignore the strength of these living forces in man. They are the springs of his action and the principles of choice.

Not only has science failed to destroy the tragic spirit, it has revealed its essential nature. For it has shown that human life can reach tragic intensity not because here and there life is informed by the majesty of rank and power but because life in all stations is enacted amid hopeless conflicts. Tragedy need not wear the royal purple. It appears wherever emotional anguish is tempered and transcended by intellectual understanding.

It is in the dual act of condemnation of nature and resignation to it that tragedy is born. To love the impossible and renounce it, to hate the necessary and yield to it, to free the intellect of the restless urge of will and so liberate it, to view evil as a thing no longer to be feared but understood, that is tragedy. It is not a dumb, desperate yielding, nor a self-pitying, regretful renunciation, but a joyous act of self-assertion and understanding. It is in human intelligence rising above animal instinct that man transcends the suffering of his frustrated will and achieves that supreme detachment that renders his experience sublime.

Such sublime resolution of the conflict is possible only in contemplation and the tragic form requires this attitude on the part of author and reader. The Greek culture, essentially one of such contemplative understanding, was particularly fertile in tragic literature. Struck by the conflict between human ideals and natural limitations, these tragedies subdued its bitterness without hiding its poignancy, and by rising above the conflict in defeat they revealed a fine sturdiness and a profound dignity in man.

It is a curious yet common interpretation of this tragic attitude that it rests on the faith that somehow the universe is aware of man and is concerned in his affairs. But while this faith was alive in the Greeks and perhaps in Shakespeare, it was incidental to tragedy. The tragic attitude demands only that the confluence of fatal events be inevitable, else the calamity gives rise not to tragedy but to a pitiful accident that greater knowledge and finer skill could easily have avoided. To Sophocles the Gods were efficacious forces in nature. Modern science has destroyed the gods but not the ineluctability of the natural order. And the modern belief that the universe is no longer concerned with man does not relieve the sting of a morally intractable nature.

It was not in their naive science but in their stern morality that the Greeks revealed the tragic spirit. And it is in the simple stately outlines of that morality that the tragic character appears. In the tragedies of Aeschylus and Sophocles the characters are simple embodiments of the moral concepts they struggle for. So abstracted and typified they assume the inflexible grandeur of the ideas that moved them. What they lost in individuality they gained in moral force and dignity.

Greek tragedy is a fundamental, unanswerable criticism of morals. All protagonists are in some sense good, yet

together irreconcilable. The spectacle of such devastating conflicts would have reduced a less philosophical people to utter nihilism and despair. A more reflective spirit finds in it a splendid expression of nobility. For man's dignity is here superbly expressed in his ability and willingness to choose suffering rather than enjoyment in humiliation, choosing rather to terminate life than deny his own ideals and natural interests.

Not the pervasive pomp of kings, nor the miraculous powers of gods, but an earnest morality furnish the foundation of tragedy. So tragic literature flourishes best in a culture where moral ideas are clearly conceived, and where preoccupation with them is the chief intellectual activity. Modern science has not rendered tragedy impossible, for the art of tragedy could be lost only in an age of complete moral scepticism. So long as man discovers moral values in a world which hinders their enjoyment, the tragic spirit will live. We are not only aware of these values but their criticism is our basic intellectual concern. For there is a ceaseless urgency with which the problems of ethics press upon us and which makes moral philosophy live even where other enterprises of reason pale to irrelevance. As the human scene shifts, as new affinities are discovered and new physical conflicts arise, morals are seen to harbor inner contradictions and inevitable calamities, and so the tragic situation is revealed. To view the consequent anguish in the aspect of necessity, without regret or pity, is the expression of the tragic spirit. For this not thunder and sceptres but a dispassionate intellect is needed, since it is only through the freedom of the mind from all desire and fear that ultimate resolution of fatal conflicts is possible.

There are two prominent characteristics in Greek and Elizabethan tragedies which are not found in modern

tragic art: the simple heroic outlines of the protagonists and their articulate eloquence. So long as the tragic artist is interested only in the clash and discord of great ideals these will remain adequate devices of expression. But no sooner does his interest extend to character than his protagonists lose their austere simplicity. The function and powers of the character become less explicit and the play can no longer unfold his heroic mission with that early single-minded intensity.

The heroes of legends and early tragedies are sharp abstractions. They express social and moral truths which are the major intellectual interests in a naive culture. Interest in individual character marks a tendency toward realism and appears only on more sophisticated levels of civilization. Aeschylus and Sophocles were traditional, and uncritically reflected the splendid naivete of the Greek legends. Euripides, who was somewhat of a critic and a philosopher, no longer remains satisfied with their simple traditional abstractions and reveals an interest in the personal and individual. This interest in character delineation no more destroyed the tragic force of Euripides than of Shakespeare, but it sowed the germs of a transformation of tragic art which has reached its consummation in our day: namely, the change from the sharply defined abstract characters of early Greek tragedy to the complex, individual persons that people our own stage.

In the tragedies of Shakespeare and the Greeks, characters meet the most poignant situations with a fitting and fluent eloquence. Here the importance and stateliness of the situation is made explicit. The action is for the moment arrested and contemplated, and the protagonist becomes the interpreter of his own experience. Macbeth on hearing of his wife's death takes an unnatural but expressive pause to reflect on the vanity and insignificance of life. Actually

the anguish felt in the situation would stay the thought and words even if the character were able to conceive them. But though in action they are false, these lines are true in meaning. It is as he might have spoken could his language grasp the full richness of his experience.

Modern tragic writers are preoccupied less with explicit statement of meanings in drama than with the faithful rendering of human behavior. So their characters are endowed with no such improbable articulateness. The situations they create are still tragic since they reveal the conflict and fatal conquest of values, but their rendering is truer in action. That ultimate reconciliation that Macbeth expresses is in modern works left to be effected in the spectator's mind.

Both this heroism of the characters and their poetic eloquence were conspicuously present in classic and Elizabethan tragedies. In these early plays life is tragic only in its ceremonious aspects and holiday moods. Princely heroes defy the thunders of the gods, and stately ghosts bring memories of lost kingdoms and faithless queens. Such royal colors and decorous temper well become the tragic spirit.

But there is also a decorum proper to life's workaday scenes, where tragedy is as poignantly present. It is such tragedy without flourish or gesture that appears on the modern stage. Life is still intense and full of vast contradictions even when seen in humbler quarters. For the tragic spirit is at home in Casterbridge as well as in Thebes, and though Hardy's mayor passes unnoticed by gods and nations he is as strong in his struggles and as great in defeat as those classic heroes whose careers arched the heavens and the earth.

The heroes of that ancient pattern are inessential features of tragedy. They are expressions of dominant social

interests. The hero lives in ancient literature not as an individual but as a race- or culture-symbol. Hence the survival of the hero in religion and in present day primitive societies. The concept recurs in modern western thought whenever morality acquires dominant racial motives as in the case of Nietzsche.

The hero is a dramatic archaism not because the modern temper has found the vision of that human grandeur baseless, but because interest has shifted from the social to the individual. In this new setting all that was superfluous in ancient tragedy is eliminated, but the fatal contradictions between will and possibility remain. These conflicts are not demeaned by restricting their scope to the individual's life and character. The ancient disharmonies between human ideals and natural limitations reappear in a "Master Builder." And these undeserved fatalities are so much more painful since no angry god or consciousness of sin can be invoked to explain them.

Sinless and godless, we see no divine justice in our failures, only the stern, irrational discrepancy between ability and desire. Having failed we can redeem ourselves only in the thought that we have dared, and that in this vain conflict we have found ourselves, that in suffering we have seen what it is to be human. It is this vision of courage and fortitude and self-assertion that yields the intellectual joys of tragedy. Life is here vindicated by art not because it is good but because it is hard and beautiful. So we can exclaim with Nietzsche: "*War das das Leben? Wohlan! Noch einmal!*"

Our modern scientific world-view enhances the fine audacity of this challenge. While science has not made man less important, it has certainly made him more lonely than in those days when he turned with fear and hope to Olympus. The gods were never so inexorably mute and deter-

minate as nature is conceived to be today. No hope is left to the modern man who has encouraged in himself desires destined to failure. For he knows that neither prayer nor sacrifice nor divine pity can stay his defeat.

So,—far from opposing the tragic spirit,—science deepens its poignant beauty. Relieved of the incidental trappings of court and altar, its sublime discords reveal a more human accent than ever. It was in an age of science that Spinoza showed tragedy to be not merely a form of art but a way of life as well. To view all things *sub specie aeternitatis* is but the courageous pessimism of tragedy. And the tragic catharsis never found more sublime expression than when that humble student of science revealed life's contemplative beauty through his *amor Dei intellectualis*.

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THE NATURE OF RIGOROUS DEMONSTRATION

FOR the past three hundred years mathematics has been developed by geniuses who were anxious to make new discoveries, to demonstrate new propositions; it has only been very recently that logicians and mathematicians have seriously turned upon their science and sought to discover the foundations upon which it is built. They have talked about rigorous demonstration, and have brought forward supposed examples of it, only later to discover that these supposed rigorous demonstrations, while correct enough, nevertheless omitted essential steps or failed to state essential presuppositions of the proof. In the effort to advance the boundaries of mathematical knowledge, the nature of rigorous demonstration has been left vague and unsettled, to the great confusion of the science. Mathematicians have endeavored to state what are *all* the postulates of given mathematical systems, but as yet no general method of discovering such postulates has been discovered. If we could find out what are the requirements of completely rigorous deductive proof, we should have such a method. It is the purpose of this paper to endeavor to state what is necessary for a completely rigorous deductive demonstration.

Let us provisionally define a rigorous demonstration as one in which are stated clearly all of the presuppositions of the proposition to be demonstrated, and in which these

presuppositions are combined in a perspicuous manner to produce the required result. Then let us see to what concrete formulation such a criterion will lead us. Certainly there could be no stricter requirement of rigorous reasoning than the one we have given, and we are seeking for the characteristics of the most rigorous and exact deductive proof.

In the modern world, mathematicians have not dealt explicitly with this problem; but in the ancient world Aristotle wrestled with it. He was troubled by the disputations of his contemporaries, and endeavored to discover a scientific method of reasoning which would determine just what inferences could be correctly drawn from given premises. He thus discovered the syllogism—the first attempt to state the requirements of rigorous proof. But Aristotle, while a competent mathematician, was not interested in the philosophy of mathematics; his logic was formulated as the result of an attempt to give to the dialectical and rhetorical disputations of his day a scientific methodology—it had nothing to do with mathematics. Its purpose was ultimately practical, the settling of disputes, rather than theoretical, the statement of the general conditions of proof. Thus formal logic and mathematics were separate in their origin. They have since pursued opposite courses. In the modern period Descartes, whose influence upon mathematics was as profound as upon philosophy, accentuated that separation; he despised the Aristotelian logic of the schools as being entirely useless, and tried to originate an intuitive logic modelled after his own procedure in his mathematical discoveries. Thus mathematics and logic have been separated, and the mathematician and logician would have little of each other. Yet both pursue the deductive method, and those mathematicians who have attempted to state the fundamental postulates of any branch of mathe-

matics have been obliged to confess that these postulates are combined in accordance with the laws of formal logic. In such a situation, is it any wonder that the nature of that logical rigor upon which mathematics prides itself should have remained entirely vague? Let us try to enter into the Aristotelian logic in the spirit of the mathematician, and then apply what we find there to mathematical reasoning. By this method we may come to an appreciation of the nature of this mysterious ideal of rigorous demonstration.

I

First we must test the rigor of the Aristotelian syllogism. Suppose we ask ourselves the question, How many propositions are implied in the drawing of a syllogistic conclusion? In Aristotelian inference, we have been accustomed to say that in a syllogism two propositions are necessary as premises, and that in immediate inference only one is needed; but that if more than two are needed, the argument can be put into the form of a set of syllogisms or immediate inferences. In addition we have talked about the *Dictum de omni et nullo*, or of the *Nota notae*. But what relation have these propositions to the premises of the syllogism? Certainly they are not premises, yet they seem to be involved in the syllogism. Similarly in mathematical inference we have reasoned that if ' $x=y$ ' and ' $y=z$,' therefore ' $x=z$,' but we have also the statement that 'Things equal to the same thing are equal to each other,' which does seem to be involved in the reasoning, yet is plainly not one of the premises.

A convenient and easy means of discovering the presuppositions of any argument is to ask ourselves the question, What propositions can be found, which are both deductively independent of all other propositions which we have already found to be presupposed by the piece of inference we are analyzing, and the separate denial of which

renders the conclusion false or invalid? For if the denial of any proposition changes the truth-quality of the conclusion, it is plainly presupposed by the conclusion, either mediately, through some other proposition, or directly. If then we eliminate all propositions from which we can deduce those which we have already found to be the direct presuppositions of the conclusion, we shall have left the few which are directly involved in our argument.

By applying this criterion to an ordinary Aristotelian syllogism, as for example, "All ruminants part the hoof," "All deer are ruminants," therefore "All deer part the hoof," we find that both premises are necessary to draw the conclusion, for if either is denied (or any proposition from which either could be deduced), the conclusion would not be necessarily true. Similarly, there is a third proposition or *canon* of combination of the premises, which, if denied, would independently prevent us from asserting the truth-value of the conclusion, namely, the rule for the combining of the premises of a syllogism in *Barbara*. For if we make the experiment of denying the rule for combining the premises in *Barbara*, that is, if we deny that *Barbara* gives a valid syllogism, the conclusion does not follow. Yet the rule for drawing the conclusion of a syllogism in *Barbara* (or any more general rule of which it is a particular case and which would be denied in denying it) is the only rule of combination which would apply to this syllogism, for evidently this syllogism presents the characteristics of a syllogism in *Barbara* and of no other. Any other statement which we attempted to put into the place of the rule for the syllogism in *Barbara* would be equivalent to our canon, and would be denied in denying it; if we used any other non-equivalent canon, the premises would not fit such a canon. Were we to change the form of one of the premises and use the rule of the hypothetical syllo-

gism, or any other form of the syllogism, we should no longer have this syllogism, but another, because we should have a different set of premises, though they might mean the same. Thus the canon of combination of premises is one of the presuppositions of the conclusion of a syllogism.

Just how the canon of the Aristotelian categorical syllogism should be stated has been discussed by logicians, but its function has not been understood, and consequently no definite agreement has been reached. The *dictum de omni et nullo, Quod de aliquo praedicatur, praedicatur etiam de qualibet eius parte*,¹ is the medieval formulation of Aristotle's statement of the canon of syllogistic reasoning. Since Aristotle regarded all forms of syllogisms as reducible to the first figure, he stated the canon in a form applicable to that figure only: "What is predicated (stated or denied) about any whole is predicated (stated or denied) about any part of the whole." As this canon seems to necessitate that the syllogism be understood in extension, the *Nota notae* was formulated for the syllogism when understood in intension, *Nota notae est nota rei ipsius*, and *Repugnans notae repugnat rei ipsi*. Mr. Joseph has derived a formulation from Kant's statement that the syllogism subsumes a cognition under the condition of a rule, "Whatever satisfies the condition of a rule falls under the rule"²; but this formulation may be objected to: it is usable only for syllogisms with an affirmative minor premise, and the terms, "condition" (which seems to refer to the middle term) and "rule" (which seems to refer to the major premise) are unnecessarily abstract and used in a confusing manner. The relations between the terms of a syllogism which is understood in extension are different from the relations of a similar syllogism when it is understood in intension. This difference is apparent when the syllogism is stated in exact

¹ See Joseph, *Introduction to Logic*, p. 296, note.

² *Ibid.*, p. 309.

symbolic terms. That fact shows us that the Aristotelian syllogism is essentially ambiguous, and that the same formula can be used for different types of reasoning—this characteristic of the Aristotelian syllogism is probably the reason that it has been so difficult to formulate its canon. Furthermore, when the major premise of an Aristotelian syllogism is a definition or a universal affirmative proposition which is convertible *per simplicem*, we have still another variety of syllogism, for it can now be used to draw conclusions which are otherwise impossible; it now needs a different canon from that used ordinarily. Either we must give the categorical syllogism a set of canons for the different types of reasoning expressed in it, or we can state the canon in the clear but cumbersome and ambiguous form, "In an Aristotelian categorical syllogism, when the eight syllogistic rules are all observed, the major term may be predicated (asserted or denied, as the rules require) of the minor term."

Our list of presupposed propositions does not stop with the premises and canon, for, by applying our criterion for finding the presuppositions of an argument, we find that a fourth proposition is also needed for the complete necessity of the reasoning, namely the proposition, "The canon of the syllogism in *Barbara* is correctly applied in this syllogism and the conclusion is derived in accordance with it"; this may be called the *validating proposition*, for it makes us certain that the canon has been correctly applied to this case of reasoning. This validating proposition or its equivalent is presupposed in the argument, for its denial renders the syllogism of no cogency, and, on the other hand, it is not logically implied by any other of the four propositions in the syllogism or by any other propositions presupposed by any one of those four. Without it or its equivalent, we could not be sure that our reasoning is valid, that is,

that the premises are of the sort to which the canon applies, that the canon is correctly applied to the premises, or that the conclusion is correctly derived by that process. Any other proposition or set of propositions from which we endeavor to derive the correctness of the syllogistic reasoning would be equivalent to this statement or part of what is included in it, and would be denied in denying the validating proposition. In asserting that the truth of the conclusion follows from the truth of the premises, we are not merely asserting that the relationship expressed in the conclusion exists, but that we *know* that it must necessarily exist, that is, that our deduction is *correct*; the validating proposition is the making explicit of this implied notion which is found in every syllogism; hence the validating proposition is a necessary part of every syllogism. For many purposes, however, the validating proposition may be neglected, because the mere statement of a validating proposition adds no *content* to the reasoning; it is not the statement of the validating proposition which is important, but its *proof*, since without that, some fallacy may be lurking in the argument. It is for the purpose of checking the truth of the validating propositions that the critic usually goes over a series of apparently valid demonstrations. In a formally invalid syllogism, it is the validating proposition which is wrongly asserted.

But the proof of a validating proposition is not to be attained by deductive reasoning. If we should attempt to establish the truth of a validating proposition by syllogistic or any other type of deductive inference, we should find ourselves involved in an infinite regress. No amount of syllogistic inference could establish such a proposition as "This syllogism has a categorical major premise with two terms and a copula," which is plainly involved in the proof of the validating proposition of a syllogism in *Barbara*. If

such a proposition were the conclusion of another syllogism, we could only base it upon some such reasoning as "The presence of certain marks indicates a categorical major premise," and "This syllogism has those marks"; then the proof of the minor premise would need other premises, such as "Some other marks indicate the presence of the first set of marks," and "This syllogism has those marks." Our major premises to these prosyllogisms might be included in a set of primitive propositions for a deductive system, but not the minor premises, and we could continue finding marks to distinguish marks indefinitely without establishing the final truth or our minor premise. The only deductive proof of a proposition is by finding that it is implied by other propositions; syllogism deals only with propositions: no train of purely syllogistic or deductive inference can attain to the knowledge of a singular proposition unless there is a singular proposition asserted to begin with. But a singular proposition for each syllogism would be an extremely unsuitable thing to include in a set of primitive propositions. Exactly similar difficulties would be met with in the attempt to establish, by deduction, any other singular proposition, such as, "This is a chair." Thus the deductive proof of a validating proposition is impossible, because the attempt to establish its truth leads us into an infinite regress of singular propositions.

This infinite regress does not mean that the proof of a validating proposition is impossible, or that the validating proposition does not belong in a syllogism, but merely that the proof of the validating proposition is not by a deductive method. For certainly we do establish the truth of validating propositions when we go over a set of syllogisms and see for ourselves that the premises do correctly imply the conclusions, or when we check up the reasoning in a logicistic

demonstration and see that the processes of substitution or other inference are carried out correctly. How is the truth of that implied validating proposition seen? Plainly by a process of mental comparison. We hold in mind the two premises of the syllogism together with the method of their combination and the conclusion, and observe that in this case the work of combination is correctly performed. There is no mystery about such a comparison; every careful reasoner who uses the syllogism has often performed it. It is possible, because all the entities concerned are mental, and because a small number of propositions can be held in the mind simultaneously, and their agreement perceived by a direct act of comparison. The material offered for synthesis is compared mentally with the definitions and rules which state the requirements for that type of syllogism, and direct observation is made as to whether the material fits the requirements or not. For instance, in the proof of the validating proposition in our example, it would be directly observed that the major premise is a categorical proposition and that it contains two terms united by a copula, that the minor premise is also a categorical proposition, that one of its terms is identical with one of those in the major premise, and that the conclusion is also a categorical proposition, which repeats the two terms of the premises and unites them by a copula in the proper order. It would be also observed that the syllogism has only three terms, that the middle term is distributed at least once, that there are no negative or particular premises, etc. Thus we see that the definition of the formal processes of reasoning and of the kinds of propositions, terms, etc., which are required in any particular type of syllogism is an essential part of the presuppositions of a syllogistic argument, and that the definitions and the rules of what has been called

“formal logic” are needed in the testing of the validity of an argument. Such a direct act of comparison as is involved in that testing is not, however, itself a deductive method of proof, since it does not derive the truth of its conclusion from the truth of one or more further propositions, but from the direct act of comparison itself. We must then admit that every syllogism contains one proposition whose proof is by a non-deductive method.

In ordinary reasoning, we do not usually express any more of our reasoning than is necessary, usually no more than what we think likely to be challenged; hence the validating proposition has been neglected, because each syllogism was supposed to be valid merely because of its statement as a syllogism. The existence of formally invalid syllogisms should have taught us that no syllogistic argument can be complete without proof of its validity and a statement that the process of checking its validity had been performed—a task which is performed in the correct assertion of the validating proposition. When an attempt is made to state all the propositions which are implied in a syllogism, the validating proposition is seen most clearly to be an essential part of every syllogism.

It was the absence of this validating proposition which enabled Mr. F. C. S. Schiller to make the objection that no syllogism can yield absolute certainty or compel assent, because even the most faultless of syllogisms is liable to the defect of ambiguity of the middle term.³ When the validating proposition is not even implicitly affirmed, not only is the defect of ambiguous middle possible, but any other of the formal fallacies and many of the material fallacies—all of which Mr. Schiller failed to mention. Once the validating proposition is proven to be true, Mr. Schil-

³ *Formal Logic*, XVI, sect. 6.

ler's objection would be no longer possible, for the true assertion of the validating proposition would eliminate any possibility of an ambiguous middle or of any other fallacy. Most logicians are convinced that a syllogism can be proven to be valid, in most cases by simple inspection, and such is shown to be the case by the successful and unquestioned use of deductive reasoning by philosophers ever since the time of Aristotle. It is of course true that particular individuals may make mistakes in asserting the truth of validating propositions, just as particular astronomers may make incorrect observations, but that fact should not make us any less sure of logical than of astronomical facts. Mr. Schiller's objection means that no syllogism can be proven to be valid, not even the traditional one which concludes that "Socrates is mortal"! If there were any fallacy in this syllogism, some one of the thousands of logicians who have been well acquainted with the fallacies to which syllogisms are liable, including the fallacy of ambiguous middle, and who have used that syllogism since the time of Aristotle, would have long ago pointed out any such fallacy!

We can now state in full form the Aristotelian syllogism which we used as our example:

Major premise: All ruminants part the hoof.

Minor premise: All deer are ruminants.

Canon: In any Aristotelian categorical syllogism, when the eight syllogistic rules are all observed, the major term may be predicated (asserted or denied, as the rules require) of the minor term.

Validating proposition: The above canon is correctly applied to this syllogism and the conclusion is derived in accordance with it.

Conclusion: All deers part the hoof.

The proof that all of these five propositions are needed

in this or any similar syllogism⁴ is that the denial of any one of the first four, even when the other three are affirmed, renders the syllogism of no truth-value; and that the place of none of them could be taken by any other proposition except one which is equivalent to it and which would therefore be denied in denying it. Furthermore these four propositions are deductively independent of each other since no one can be inferred from any of the others, and since the denial of no one leads to a denial of any other.⁵ We may call the first two the *material propositions* or *premises*, since they contribute the *content* to the reasoning, and the next two the *formal propositions*, since they have to do with the *logical operations* performed in the syllogism. There can be no more than these five propositions in any such syllogism, since the two premises contain all the material content found in the conclusion, and any further content which might be thought to be found in the conclusion would also have to be found in the premises or else the syllogism would be invalid.⁶ The formal propositions also state the entire content of the operation performed in the syllogism, and

⁴ The validating proposition and the canon of any syllogism may be combined into one proposition and thus the number of propositions in the syllogism reduced by one; but that would rob the canon of its generality, and make it applicable only to this syllogism and no other; to establish such an individual validating-canon, the two propositions which we have called the canon and the validating proposition would be needed, and so the number of pro-syllogisms would be merely increased.

⁵ Since the validating proposition *contains* the canon as one of its parts, the denial of the canon might seem to render necessary the denial of the validating proposition; but such is not the case, since the canon is not *asserted* in the validating proposition, but merely *considered*. The removal or change of the canon would necessitate a change in the validating proposition, but its denial would not do so.

⁶ The number of premises might be increased to three or more and all of them combined into one conclusion by a different canon. Such reasonings are found, but for the sake of simplicity, we shall neglect them, since they can always be decomposed into a syllogism which has only two premises, and the conclusion of that syllogism combined with one of the remaining premises, etc. Complex reasonings of this sort may save time, but perhaps a new name, other than 'syllogism,' should be given to them.

sum up all the presuppositions of that operation. If there could be any more formal propositions, it would be possible to have some new kind of formal fallacy in the syllogism, different from those already known. But it may be safely concluded that if there were any such, some of the logicians since Aristotle would have discovered it.

While our reasoning has been concerned with this particular syllogism, yet it has been in no way dependent upon this example, but has been general throughout, just as the geometrician uses a particular figure to illustrate his reasoning, but does not depend upon it for the truth or generality of his reasoning. So we may safely infer from the general character of our argument that every Aristotelian categorical syllogism has five and only five propositions. Not only so, but a similar argument would show that the other forms of Aristotelian syllogisms, whether hypothetical, disjunctive, or in any other of the traditional forms, being similar in nature, also require these two formal propositions to state all that is implied in the argument. Thus our proof that every Aristotelian syllogism contains *five* and *only five* propositions is complete.

We have now put the Aristotelian syllogism into a form in which reasoning by means of it may be said to be completely rigorous, since we have succeeded in stating all the presuppositions of the resulting conclusion, and have put them into such a form that their combination and the manner thereof is clear and open to inspection. We thus see that deductive inference is not a mysterious indefinable operation, but that it can be defined and described in terms of the analysis we have made. Aristotelian inference in its logical (not psychological) nature is merely a combination of statements into another statement in accordance with an accepted rule. We shall see later that this definition holds

of all deductive inference. We further see that the cogency or apodictic necessity of a syllogism or syllogistic reasoning is not due to any mysterious form into which the reasoning is thrown, but to the implicit (or explicit) assertion of the canon and the validating proposition of each syllogism, which render the drawing of the conclusion logically inescapable and hence necessary. The "form" of the two material propositions is merely a device to enable the formal propositions to work upon the material propositions to produce the conclusion. Any syllogism which does not explicitly state all five of its presupposed propositions should be called an enthymeme.⁷

A similar analysis of the traditional or Aristotelian immediate inference shows that it too has its formal propositions. When we pass, for example, from the premise, "No men are immortal," to the conclusion, "No immortals are men," by the use of our rule for discovering the presupposed propositions, we see that in addition to the convertend, there is presupposed the canon of conversion, "An E proposition may be converted simply," and also a validating proposition, "The canon of the conversion of an E proposition is correctly applied to this convertend." The proof of this validating proposition depends upon a similar holding in mind of the material under consideration and careful observation that the canon is correctly applied to it and the conclusion thereby produced. We may then define immediate inference as reasoning which proceeds from only one premise to a conclusion, with the help of two formal propositions, a canon and a validating proposition, and likewise define the syllogism as reasoning which proceeds

⁷ Consequently the number of types of enthymemes is increased to sixteen; since, of the three propositions, the two material premises and the conclusion, two must always be present, certain types of enthymeme, e. g., where the minor premise and the conclusion are absent, are impossible. Otherwise the entire syllogism cannot be reconstructed from the data given.

from two premises to a conclusion with the help of two formal propositions. Leibniz showed that it is possible to throw any immediate inference into the form of a syllogism, by the use of a tautologous proposition as one premise,⁸ and thus immediate inference can be considered to be a means by which certain commonly used sorts of syllogistic inference may be abbreviated, through a change in the canon used to derive the inference.

We have thus found, by an analysis of the Aristotelian syllogism, that every syllogism contains a definite number of propositions, namely five, which are discovered by the process of searching for all the deductively independent propositions whose denial would invalidate the inference. These five are the two material propositions or premises, the two formal propositions, namely, the canon of inference and the validating proposition, and the conclusion. Immediate inference was found to contain one less premise, but otherwise to be analogous to the syllogism. In this way these two traditional forms of inference become modes of completely rigorous reasoning. With this analysis, let us turn to mathematical and logistic deduction, and see if we cannot find a similar condition there.

II

Aristotle, in defining the syllogism as "Discourse in which, certain things being posited, something else than what is posited necessarily follows on their being true," was not defining the syllogism so much as he was stating the general characteristic of all deduction. The term, syllogism, has been reserved for that type of inference which has two premises and a conclusion, and for the varieties of that type which Aristotle enumerated. Since his time, logicians, following the lead of the mathematicians, have dis-

⁸ *New Essays*, IV, ii, sect. 1.

covered other types of deductive reasoning which are of greater usefulness, and the traditional syllogism has fallen into disrepute. The logician needs a word to refer to any type of deductive inference which combines two premises into a conclusion, and so we may well use the term "syllogism" to refer to such a piece of reasoning, and distinguish those forms of inference which Aristotle enumerated, which have been traditionally called "syllogisms," as the "Aristotelian syllogisms," in contrast to other types of syllogisms. Such will be the meaning of these terms in this paper. We shall find that these other types of syllogisms are essentially similar to the Aristotelian syllogisms.

A careful analysis of what has been called "non-syllogistic inference" shows that it can always be stated in the form of two premises and a conclusion; for, wherever more than two propositions are combined, two of them may first be combined, and then the remaining propositions may be combined successively with the conclusion of the preceding combination. Study of each case of combination will show that, like the Aristotelian syllogism, a canon of inference and a validating proposition are implied—the analogy between the Aristotelian syllogism and the different sorts of "non-syllogistic" inference, when analyzed into sets of combination of two premises, is so close that it is no misnomer to call them syllogisms. We may then say that the syllogism (together with its abbreviation, immediate inference) is the unit of deductive inference. As an example, we take the relational inference that because "John is older than Mary," and "Mary is older than William," therefore "John is older than William." When we search for the propositions which are deductively independent and the separate denial of which renders the conclusion false or invalid, we find that in this inference there is implied a

canon, "In inferences in which the terms of two propositions are joined by an asymmetrical transitive relation to a middle term, the subject term of the first premise may be asserted to have this relation to the predicate term of the second premise," and also a validating proposition, "The above canon is correctly applied to this reasoning." In such relational inference it is difficult to call either premise major or minor, and so we may perhaps call the one whose predicate contains the middle term the *first premise*, and the one whose subject is the middle term, the *second premise*. Such is the meaning of these terms in the statement of the canon above.

Analysis of mathematical reasoning will show a similar condition. Such an analysis enables us to clear up misconceptions about the logical function of certain long-used propositions. For example, we take the inference that because " $x = y$," and " $y = z$," therefore " $x = z$." Evidently the axiom that "Things which are equal to the same thing are equal to one another" is involved in this piece of reasoning, but just how has not been clear; it has been both asserted and denied that the axiom is the major premise. The foregoing analysis of syllogistic inference shows us that the two material propositions are " $x=y$ " and " $y=z$," and that the axiom is really the canon of inference by which the two premises are combined. A validating proposition is also implied in the argument, as the experiment of denying it will show. We can now state this piece of reasoning in full as follows:

First premise: $x = y$

Second premise: $y = z$

Canon: Things which are equal to the same thing are equal to one another.

Validating proposition: The above axiom of equals is correctly applied to this syllogism.

Conclusion: $x = z$

Logistic inference shows the same characteristics. For analysis we pick at random a brief demonstration from Mr. Lewis's exposition of the Boole-Schroeder Algebra of Logic;⁹

Theorem 2·6. If $a \subset 0$, then $a = 0$

Major premise: $a \subset b$ is equivalent to $a \cdot b = a$ (1.9)

Minor premise: 0 may be taken as equivalent to b

(A restatement of the usual form, Let $b = 0$)

Canon: In any general proposition, any values of the variables of that proposition may be substituted for the variables, provided the substitution is made in each case of the occurrence of the variable.

(This important canon of substitution of values is used throughout by Mr. Lewis, but is only referred to on p. 357, (7).)

Validating proposition: The canon of substitution of values is correctly applied to this syllogism.

Conclusion of this and *major premise* of the next syllogism:

$a \subset 0$ is equivalent to $a \cdot 0 = a$

Minor premise: $a \cdot 0 = 0$ (1.5)

Canon: Equals may be substituted for equals.

(See p. 357, (6).)

Validating proposition: The canon of substitution of equals is correctly applied to this syllogism.

Conclusion: $a \subset 0$ is equivalent to $a = 0$ Q.E.D.

We thus see that mathematical and logistic reasoning are quite analogous to the Aristotelian categorical syllogism, with the difference that the relations between the terms of each proposition and the canon of inference are (usually) different. Here again two material propositions or premises and two formal propositions, the canon of inference and the validating proposition, are necessary to draw a conclusion.

The analogues of Aristotelian immediate inference in mathematics and logistic are interesting. They are found where some rule of operation is applied directly to a proposition without the aid of a third proposition. In this type

⁹ *A Survey of Symbolic Logic*, p. 123.

of inference, mathematics and logistic have been more interested in the canons of operation than in drawing particular inferences, and so have stated their canons explicitly. But Aristotelian logic, in harmony with its genesis and tradition of alliance with rhetoric and argumentation, has concentrated upon the individual transmutations, rather than upon the canons. As an example of non-Aristotelian immediate inference let us take a problem from Mr. Lewis' exposition¹⁰ of the Classic Algebra of Logic.

Premise: $F(x, y) = pxy + q - xy + 0x - y + 0 - x - y$

Canon: The negative of any function, in the normal form, is found by replacing each of the coefficients in the function by its negative. (6.49.)

Validating proposition: The foregoing function is in the normal form and the canon is validly applied to it.

Conclusion: $-F(x, y) = -pxy + -q - xy + x - y + -x - y$

Thus any application of a rule of operation results in a case of immediate inference.^{10a}

With this understanding of the syllogism and immediate inference, which are the two fundamental forms of all deductive reasoning, we can make an analysis of a piece of mathematical reasoning. To the mathematician such an analysis will seem unduly prolix, because the ideal of mathematical elegance is to be brief, but only in this manner can all the elements involved be exhibited. It will be seen that it falls easily into these two fundamental forms of deduction. We have purposely selected a trite example, because it illustrates so well the principles involved.

To solve $x^2 - 3x + 1 = 0$ for x , by the formula for quadratic equations.

¹⁰ *Ibid.*, p. 142.

^{10a} Since the term "immediate inference" is not really suitable to this sort of reasoning, perhaps it might better be called "transformation," for mathematical transformation often falls into this form of deduction.

A
syllo-
gism
of
substi-
tution
of
values

Maj. prem.: If $ax^2 + bx + c = 0$, then

$$x = -\frac{b}{2a} \pm \frac{1}{2a} \sqrt{b^2 - 4ac}$$

Min. prem.: 1 may be taken as the value of a , and -3 may be taken as the value of b , and 1 may be taken as the value of c .¹¹

Canon: In any general proposition, any values of the variables of that proposition may be substituted for the variables, providing the substitution is made in each case of the occurrence of the variable.

Valid. prop.: The canon of substitution of values is correctly applied to this syllogism.

A
hypo-
thetical
syllo-
gism

Concl. and Maj. prem.: If $x^2 - 3x + 1 = 0$, then

$$x = -\frac{-3}{2 \times 1} \pm \frac{1}{2 \times 1} \sqrt{(-3)^2 - (4 \times 1 \times 1)}$$

Min. prem.: $x^2 - 3x + 1 = 0$

Canon: The assertion of the antecedent of a hypothetical proposition permits the valid assertion of the consequent.

Validat. prop.: The canon of the hypothetical syllogism in the *modus ponens* is correctly applied to this syllogism.

Imme-
diate
infer-
ence

Concl. and prem.: $x = -\frac{-3}{2 \times 1} \pm \frac{1}{2 \times 1} \sqrt{(-3)^2 - (4 \times 1 \times 1)}$

Canon: A number multiplied by unity gives itself.¹²

Validat. prop.: The foregoing canon of immediate inference is correctly applied to this inference.

Concl. and Maj. prem.: $x = -\frac{-3}{2} \pm \frac{1}{2} \sqrt{(-3)^2 - 4}$

¹¹ This minor premise is a restatement of the usual mathematical form, Let $a = 1$, $b = -3$, $c = 1$. It is composite, and to be quite strict, it should have been divided into three propositions and the canon of inference applied three times with three different validating propositions, making three separate syllogisms. But the reasoning is quite prolix without doing that, and since it is clear what the form of reasoning is, I have left it in the form of one syllogism with a composite minor premise.

¹² To be quite strict, there should be as many applications of the canon of multiplication by unity as there are cases in the premise where a number is multiplied by unity, and thus there should be three successive and similar immediate inferences with different validating propositions for each one.

A syllogism of substitution of equals

$$\left\{ \begin{array}{l} \text{Min. prem.: } (-3)^2 = 9 \\ \text{Canon: Equals may be substituted for equals.} \\ \text{Validat. prop.: The canon of substitution of equals is} \\ \text{correctly applied to this syllogism.} \\ \text{Concl. and Maj. prem.: } x = -\frac{-3}{2} \pm \frac{1}{2} \sqrt{9-4} \end{array} \right.$$

A syllogism of substitution of equals.

$$\left\{ \begin{array}{l} \text{Min. prem.: } 9-4 = 5. \\ \text{Canon: Equals may be substituted for equals.} \\ \text{Validat. prop.: The canon of substitution of equals is} \\ \text{correctly applied to this syllogism.} \\ \text{Concl. and prem.: } x = -\frac{-3}{2} \pm \frac{1}{2} \sqrt{5} \end{array} \right.$$

Immediate inference

$$\left\{ \begin{array}{l} \text{Canon: The product of like signs produces a positive} \\ \text{sign.} \\ \text{Validat. prop.: The canon of 'like signs' is correctly} \\ \text{applied to this inference.} \\ \text{Concl. and maj. prem.: } x = \frac{3}{2} \pm \frac{1}{2} \sqrt{5} \end{array} \right.$$

A syllogism of substitution of equals

$$\left\{ \begin{array}{l} \text{Min. prem.: } \frac{3}{2} = 1\frac{1}{2} \\ \text{Canon: Equals may be substituted for equals.} \\ \text{Validat. prop.: The canon of substitution of equals is} \\ \text{correctly applied to this syllogism.} \\ \text{Concl.: } x = 1\frac{1}{2} \pm \frac{1}{2} \sqrt{5} \end{array} \right.$$

Further investigation would show us that syllogisms may be classified in accordance with their canons. It is an important and as yet largely unaccomplished task for logicians to state and classify the canons of different types of syllogisms in order that different types of inference may be distinguished and the requirements of each type determined. As long as only one type of syllogism

was allowed—that of Aristotelian categorical syllogism in the first figure—and as long as all other forms of inference, even the hypothetical and disjunctive syllogisms, were considered to be merely forms of categorical inference, this neglect of the canon of reasoning might have been excusable; but now that other types of syllogisms have been widely recognized and regularly used by logicians, especially in symbolic logic, it is essential that they be analyzed and enumerated.

Of course a mathematician would be extremely impatient at such prolix figuring; even a bright beginner would

probably have jumped from $x = \frac{b}{2a} \pm \frac{1}{2a} \sqrt{b^2 - 4ac}$ and

$x^2 - 3x + 1 = 0$ to $x = 1\frac{1}{2} \pm \frac{1}{2}\sqrt{5}$ at one step. He would thus have illustrated the way the practical reasoner thinks. But he could not have been able to show the wealth of mathematical thought which underlay such a simple process as solving a quadratic equation by formula, and he could not have more than faintly conceived the number of mathematical and logical propositions which required demonstration before such a simple process could be made completely rigorous. By the time he had demonstrated all the minor premises, together with the canons (where they are not primitive propositions), in this simple piece of reasoning, he would have been carried through much of algebra and arithmetic, as well as much of formal logic. Were he to include the enabling propositions in his systematic verification, he would also have had to search for the definition of each type of syllogism and proposition, and the proof could only be by a non-deductive process, which consists in observing that the syllogism and its parts correspond to what would be expected of a valid syllogism.

Another investigation would also show that immediate

inference and the syllogism are by no means independent of each other, but that the first is a means of abbreviating the second. If the major premise of the first syllogism in our last illustration had been stated in a suitable manner,¹³ it could have been used as the canon for an immediate inference, and the conclusion of the second syllogism could have been drawn directly. Likewise the two immediate inferences could have been stated as syllogisms by the use of suitable minor premises. Thus logistic and mathematical immediate inference, like Aristotelian immediate inference, is seen to be a method of abbreviating certain kinds of commonly performed operations, which could also be stated as syllogistic demonstrations, through a change in the canon of inference.

It should not be supposed that a proposition which is used as a canon of deductive inference is sacrosanct and cannot be used for any other purpose. While many such canons are primitive propositions for most deductive systems, in a well-developed system, these canons may become premises as well as canons, and other propositions inferred from them. An analysis of the procedure of *Principia Mathematica* will bear out this statement. This work takes the canon of the hypothetical syllogism as one of its primitive propositions (*1.11) and from it and some other canons (which are assumed and not stated) it deduces the canons of the categorical and other syllogisms.

If now we define deduction as that type of reasoning in which, from the truth of one or more propositions, we derive the truth of a further proposition, we can prove

¹³ As, for example: In any quadratic equation which is stated in the normal form, i. e., with the coefficients of x^2 , x^1 , and x^0 summed, and the whole put equal to 0, x will be equal to the negative of the result of dividing the coefficient of x^1 by twice the coefficient of x^2 plus or minus the product of "unity divided by twice the coefficient of x^2 " by the square root of "the square of the coefficient of x^1 less 'four times the product of the coefficient of x^2 by the coefficient of x^0 '".

generally that all deductive reasoning is syllogistic (in the broader sense of the term), that each syllogism contains the five propositions which we have enumerated, and that completely rigorous deduction consists in throwing the reasoning into the form of syllogism and immediate inference.

Any inference, unless the conclusion has the same or similar meaning as the premise (*i.e.*, is an immediate inference), proceeds from one statement to another, *i.e.*, from one proposition to a different one. But if there is a difference of meaning between the conclusion and the premise, other than a difference in statement of the same meaning, that difference can only be due to the presence of one or more additional ideas (new relations or terms). Now the introduction of a new idea can be justified only by the presence (implicit or explicit) of an additional organized meaning or meanings, which can be stated in the form of one or more propositions. Thus any inference which is more than the repetition of the same meaning in different words can only be justified by the use of at least two propositions which contain the meanings which are combined to produce the conclusion. If more than two propositions are needed, either the set of propositions can be put into the form of a series of proofs which give the conclusion expressed in the piece of reasoning under consideration, or else these propositions can be combined in such a manner as to leave only two propositions (or both). Thus in any deductive inference, it is always possible to sum up the material presuppositions of an inference (providing it is not an immediate inference) into two propositions, and never possible to state these presuppositions in one proposition alone. Hence two material propositions are necessary for every deductive inference (except immediate inference), and the syllogistic character of all deduction is established.

If two propositions (material propositions or premises) are combined in some way to make a third or conclusion, this combination must be made by some rule. Combinations, if they are to be cogent, cannot be made at random, but only in accordance with some accepted orderly rule. This rule is evidently one of the presuppositions of the inference, and whenever we are testing the rigor of an inference by bringing to light its presuppositions, this rule or canon must be expressed. Furthermore, this rule or canon must be correctly applied to the two material propositions under consideration. The correctness of such an application will depend upon the nature of the inference under consideration and the sort of material needed for such an inference, upon the correct use of the rule in dealing with the material, and upon the correct derivation of the conclusion by that application. The correct application of the canon to the material cannot be taken for granted; the existence of formally invalid inference, where the material and the rule may be expressed, but the material does not fit the rule, warns us against merely assuming the correctness of inferences. Hence the correct application of the canon to the material propositions under consideration is also a presupposition of every valid conclusion, and this fact should also appear in the statement of the presuppositions of every inference. Thus four propositions are presupposed by the conclusion of every deductive inference (unless it is a case of immediate inference), whether the reasoning is by means of an Aristotelian syllogism or a mathematical or logistic deduction or any other form of deductive inference. The logical independence of these four propositions is shown by the fact that none of them can be inferred from any of the others, and the denial of any one of them does not necessitate the denial of any other. Because of the analogous character of these different forms

of deduction, they may all be called syllogisms, and the term "Aristotelian syllogism" used to distinguish what has traditionally been called the "syllogism." The derivation of the word, syllogism, from the Greek term for a "collecting" of premises also justifies us in the extension of the meaning of this word. A similar proof would show that immediate inference is analogous to the syllogism, except that it has only one premise.¹⁴

¹⁴ Mr. Russell has challenged any such analysis according to which every piece of deductive reasoning must have a definite number of premises and propositions, in *Principles of Mathematics*, sect. 39, pp. 35-6. His argument seems to be that all the propositions implied as premises to any conclusion may be simultaneously asserted as a single proposition, and that by the process of 'exportation it is always possible to exhibit an implication as holding between single propositions.' The process of 'exportation' is that of changing a syllogism into an immediate inference, which change often renders the process of inference less clear, and, in the illustration which Mr. Russell gives, seems to require syllogistic demonstration of the conclusion of the syllogism (i. e., that the conclusion r does follow from the premises p and q) before it can be applied. The simultaneous assertion of several premises, if it is the stringing of them together by 'and', does not change their deductively independent nature; on the other hand, if such a simultaneous assertion is the combination of the propositions into another unity, it is itself a syllogistic process.

Elsewhere, (p. 41), Mr. Russell states that 'the rule according to which the inference proceeds is not required as a premiss', and he supports this statement by the infinite regress which would ensue if a deductive proof were offered for what Mr. Russell calls the 'rule.' By the term, 'rule,' he does not mean the proposition which we have called the canon, but the proposition which would result from the combination of the canon and the validating proposition. We have recognized that an infinite regress would result in any attempt to demonstrate a validating proposition by purely deductive means; but the non-deductive nature of the proof of a validating proposition does not justify either its elimination nor that of the canon. The necessity of these two formal propositions in every syllogism or immediate inference is shown by the fact that a denial of either of them, even if combined with the assertion of the other propositions of the syllogism, renders the syllogism invalid, and that no other proposition which is not equivalent to them could take their place.

Mr. Russell has taken the mathematician's practical attitude of attaining the conclusion with a minimum of effort when he proposes to drop such a 'rule' because the argument is valid without explicitly stating it; and he deliberately rejects the philosophical attitude of searching for all the presuppositions of an inference. He recognizes that there is a 'rule' in every deductive inference, and that an attempt to validate this 'rule' by a deductive process leads to an endless regress, and so he proposes to neglect such a rule, because the lack of an explicit statement of the rule does not invalidate the reasoning! He fails to remember that rigorous demonstration makes explicit all that is merely implicit in a piece of reasoning, and so he sacrifices rigor to easy attainment of the goal. Kant was right, as against Mr. Russell, in holding that the synthetic processes of mathematics rely upon intuition.

In the syllogistic character of all deductive demonstration, whether mathematical, logistic, or Aristotelian, we have discovered the nature of complete logical rigor. For it is only by throwing a demonstration into this form that it is possible to state all the presuppositions of the argument and to show clearly and exactly how they are combined to produce the given conclusion. By so doing, the logical nature of the argument is fully enunciated, and it is completely thrown open to criticism. Hidden presuppositions, inaccurate statements, incorrect combinations are all expressed, and easily recognized by the discerning critic. Because of the non-deductive nature of the proof of a validating proposition, there may be an opportunity for inaccuracies to creep in through the incorrect affirmation of such propositions; but the careful critic will check over these validating propositions, and so obviate that source of error. The complete statement of the material and formal propositions of a syllogism renders such checking very easy. The reason that the validating proposition has been neglected by logic is probably that its statement adds little to the correctness of the argument; it is only its proof which is worth while. The omission of the validating proposition in the statement of an argument leads to no difficulty, providing that its presence is clearly understood. The same situation is found in dealing with records of empirical observations—the correspondence of the recorded observation with the observed experience needs to be checked, and a careful scientist will repeat and check the observation, but the statement that a check has been made adds nothing of itself to the correctness of the record, although it adds much to our confidence in it. In deduction we have the immense advantage of dealing with permanently unchangeable materials, so that the correctness of the validating proposition is always open to observation. We may con-

clude that the nature of rigorous demonstration is to be found in throwing each step of an argument into the form of a syllogism and thus laying it bare to criticism.

In the syllogism there is also to be found a powerful instrument for discovering the ultimate presuppositions of any deductive argument, enabling the enunciation of *all* the primitive propositions of any deductive or mathematical system. For the statement of the five propositions of a syllogism or the four propositions of an immediate inference gives a complete statement of the immediate presuppositions of any given conclusion; we have only to seek for a full statement of the prosyllogism which demonstrates the truth of each of the material and formal propositions of our original syllogism and for the prosyllogism to each of the propositions thus found, and so on, to arrive at a complete statement of the primitive propositions of the demonstration. Thus the process of throwing a demonstration into completely syllogistic form is at the same time a discovery of all of its presuppositions. Such a procedure would not necessarily assure us that we had decomposed all of the presupposed propositions into their simplest form, for there might be a prosyllogism to one of our apparently primitive propositions which we had not noticed; thus the syllogistic statement of an argument is no guarantee that a statement of the *ultimate* or simplest presuppositions has been made; but at least such a procedure assures us that we have omitted none of these ultimate presuppositions, since they would necessarily be implicit in the list of presuppositions which we have discovered, and consequently the task of enunciating them would be rendered very much easier. The syllogism is thus shown to be an extremely powerful instrument of logical analysis.

It may be worth while here to consider some of the conclusions to which the foregoing analysis leads us. In the

first place, it shows the futility of the hope which Socrates expressed in the *Republic*, of deducing all knowledge from *one* proposition. Aristotle showed the futility of this hope,¹⁵ but it has reappeared again and again in the history of philosophy, most recently in Cassirer's ideal of a "scientific concept" which has "concrete universality" because from it can be deduced the special cases which it subsumes.¹⁶ But the very illustration which he gives shows that such a "scientific concept" is impossible, for he gives the example of the general formula of a curve of the second order, from which we can deduce the special geometrical forms of the circle, the ellipse, etc. That process of derivation, however, as he himself states, is by the introduction of a certain parameter, which is allowed to vary. Thus the general formula is the major premise of the deduction, but before the circle can be derived, it is necessary to introduce a parameter, which is the minor premise; and if two premises are combined, that must be done in accordance with a rule, and the rule must be observed to be correctly applied to the case—thus *four* propositions are inevitably implied in the deduction of a circle from the general equation of a curve of the second order, and so at least *four* concepts are shown to be needed, not only one! Each different curve deduced from the general formula would require at least two propositions which are different from any other, a different parameter and a different validating proposition. The ideal of deduction from only one proposition is chimerical.

Our analysis furthermore shows us that purely deductive reasoning is powerless to draw a single conclusion with certainty. It has long been known that deduction is unable to provide its own first premises; but it has not been seen that even when a set of primitive premises is provided,

¹⁵ *Post. Analytics*, I, iii, 4.

¹⁶ *Substance and Function*, I, i, iii.

nothing can be drawn from them with certainty by deduction alone, because each cogent act of deduction requires the (implicit or explicit) proof and assertion of a validating proposition, which can refer to "this syllogism" or "this immediate inference" alone. The ultimate reason for the necessity of a validating proposition lies in the fact that the conclusion of a syllogism does not merely assert the *existence* of a particular fact or relation, but it asserts that as a consequence of our original presuppositions we *know* that such a fact or relation *must necessarily* exist; hence the drawing of a conclusion implies not merely the premises, but the fact that the conclusion is *properly* drawn, which presupposition is stated in what we have called the validating proposition.

The realization of the helplessness of purely deductive reasoning because of the necessary presence of a validating proposition which cannot be established by deductive processes has not dawned upon some logicians, and we find them living in realms of eternal truth and denying cogency to any non-deductive reasoning! Unless some non-deductive process can give just as much certainty as deductive processes, deduction itself cannot give certainty. Since a validating proposition is always a singular proposition which refers to "this syllogism" and no other, a deductive proof of such a proposition must depend upon the ultimate assumption of some proposition concerning "this syllogism." Unless a primitive proposition referring to each syllogism is included in the primal assumptions of the system, no validating proposition could be deduced, for a singular proposition cannot be deduced from a universal proposition, except by the aid of another singular proposition. Furthermore a validating proposition would be required for the syllogism which establishes the first validating proposition, and the second one will require a third,

and so there will be another infinite regress! The truth is merely that the proof of a validating proposition is not by a deductive process, but by a non-deductive process of observation.

Our analysis shows us, in the third place, the hopelessness of the ideal of modern rationalism, that of founding demonstration upon a *small* number of self-evident or otherwise established postulates, and, by deduction alone, of deriving a philosophic system. A pure rationalism of this sort would have to list all of its validating propositions among the presuppositions of the system, the number of which would be equal to the number of syllogisms and immediate inferences in the system! The more inclusive and well worked-out the system was, the larger the number of primitive propositions! Yet if the validating propositions were omitted, the system could not have only deductive certainty or necessity. A rationalism which depends solely upon deduction from a small number of propositions is impossible; but, if validating propositions can be established by a non-deductive means, why should philosophy depend exclusively upon deduction?

It is further to be noted that the syllogism, as we have analyzed it, is not an instrument of discovery, but merely of criticism. The usual psychological procedure of thought is to arrive at the conclusion first, by an act of intuition, and then afterwards, often by laborious thought, to analyze out the steps by which that conclusion is demonstrated. Poincaré has left us some admirable examples of the psychological process of mathematical discovery in his account of his own discoveries. Recognition of the purely critical function of the syllogism will go far to invalidate the traditional objections to it, such as the objections that it yields nothing new, that it is useless to discover truth, and that it does not represent the course of thought in reasoning. The

function of the syllogism is merely to test an inference which is already drawn, to determine its validity or to indicate what propositions are needed to establish a conclusion whose ground is already partially given. It has little to do with psychological processes of thought, but much to do with logical processes of proof.

To sum up: We have found that there are analogues of the Aristotelian syllogism in other types of deductive inference, which analogues may well be called syllogisms, and we have also found that the traditional immediate inference has likewise its analogues in mathematical and logistic inference. Had we pursued our investigations further, we should also have found analogues of the enthymeme, sorites, and other forms of Aristotelian inference. We found that each syllogism, of whatever sort, contains a definite number of propositions, namely *five*, which are discovered by the process of searching for all the deductively independent propositions whose denial would invalidate the inference. These five are the two material propositions or premises, which may be distinguished as major and minor, or undistinguished in importance and called merely first and second premises, the two formal propositions, the canon of combination and the validating proposition, and the conclusion. A case of immediate inference was found to contain one less premise, but otherwise to be analogous to the syllogism; it was found to be a means of abbreviating certain kinds of syllogistic inference. Both the syllogism and immediate inference, in fact all deductive inference was found to contain a non-deductive element, and hence we found that nothing can be established by deduction alone, and that unless certainty can be had by some non-deductive process, no certainty can be obtained by deductive means. Syllogisms may be classified in accordance with their types of canons, and all deductive

reasoning can be reduced to syllogisms and immediate inferences. In this syllogistic analysis of deductive argument we discover the instrument whereby complete logical rigor could be obtained, and a means of discovering all the presuppositions of any deductive argument.

III

In order to illustrate the power of syllogistic analysis as applied to mathematical arguments, both to give logical rigor and to discover unperceived presuppositions, we here give a syllogistic analysis of the first demonstrated proposition in *Principia Mathematica*. Whitehead and Russell assert that they have made all their assumptions explicit¹⁷ in their list of primitive propositions, and that they do not presuppose the operations of logic. We shall see that this demonstration, like all other demonstrations, falls into the form of syllogism or immediate inference; but that, owing to the authors' failure to understand the syllogistic nature of all deductive inference, they have failed in their announced attempt to exhibit all the primitive propositions upon which their systems rests, in spite of their statement that 'proofs will be given very fully'.¹⁸

The first demonstrated proposition in the *Principia*, *2.01, is given as $\vdash : p \supset \sim p \cdot \supset \cdot \sim p$, which is the principle of the *reductio ad absurdum*. It is concisely demonstrated as follows:

$$\left[\begin{array}{c} \text{Taut} \\ \hline \sim p \\ p \end{array} \right] \vdash : \sim p \vee \sim p \cdot \supset \cdot \sim p \quad (1)$$

$$[(1) \cdot (*1.01)] \vdash : p \supset \sim p \cdot \supset \cdot \sim p$$

This proof is analyzed and stated in full syllogistic form below, with references to all those propositions which are mentioned by the authors.

First syllogism.

¹⁷ *Principia*, Pt. I, Sect. A, Introduction to the section.

¹⁸ *Ibid.*, p. 102.

Maj. prem.: If p is a variable elementary proposition, $\sim p$ is a variable elementary proposition.

(*1.7 of the *Principia*, but not quoted in the demonstration of *2.01. I have added the term 'variable' to it, in order to simplify the demonstration.)

Min. prem.: $\sim p$ is a variable elementary proposition

(This primitive proposition is implied in the introduction, but nowhere expressed.)

Canon: The assertion of the antecedent of a hypothetical proposition permits the valid assertion of the consequent.

(A restatement of *1.11.)

Validat. prop.: The canon of the hypothetical syllogism in the *modus ponens* is correctly applied to this syllogism.

(Proved by inspection.)

Concl.: $\vdash \cdot \sim p$ is a variable elementary proposition.

Second syllogism.

Maj. prem.: Any elementary proposition may be taken as a value of any other variable elementary proposition, in a proposition containing variable elementary propositions.

(A primitive proposition, *not* stated in the *Principia*.)

Min. prem.: $\vdash \cdot \sim p$ is a variable elementary proposition.

(The conclusion of the first syllogism.)

Canon: Any value of a variable may be substituted for the variable, provided that the substitution is made for each case of the occurrence of the variable.

(This important canon of substitution of values is assumed and used frequently throughout the *Principia*, but is *nowhere* stated.)

Validat. prop.: The canon of the substitution of values is correctly applied to this syllogism.

(Proved by inspection.)

Concl.: $\vdash \cdot \sim p$ may be taken as a value of any other variable elementary proposition in a proposition containing variable elementary propositions.

Third syllogism.

Maj. prem.: $\vdash \cdot \sim p$ may be taken as a value of any other variable elementary proposition in a proposition containing variable elementary propositions.

(The conclusion of the second syllogism.)

Min. prem.: $\sim p$ is a variable elementary proposition

(This primitive proposition is implied in the introduction but is nowhere expressed.)

Canon: Any value of a variable may be substituted for the variable, provided it is done systematically.

(The same canon as that of the second syllogism.)

Validat. prop.: The canon of substitution of values is correctly applied to this syllogism.

(Proved by inspection.)

Concl.: $\vdash \sim p$ may be taken as a value of p in a proposition containing variable elementary propositions.

Fourth syllogism.

Maj. prem.: $\vdash : p \vee p \supset p$

(*Principia* *1.2; in the authors' demonstration it is expressed by 'Taut'.)

Min. prem.: $\vdash \sim p$ may be taken as a value of p in a proposition containing variable elementary propositions.

(The conclusion of the third syllogism; expressed in the authors' demonstration by $\sim p$)

p

Canon: Any value of a variable may be substituted for the variable, provided that substitution is made systematically.

(The same canon as that of the second syllogism.)

Validat. prop.: The canon of the substitution of values is correctly applied to this syllogism.

(Proved by inspection.)

Concl.: $\vdash : \sim p \vee \sim p \supset \sim p$

Fifth syllogism.

Maj. prem.: $\vdash \sim p$ may be taken as a value of any other variable elementary proposition, in a proposition containing variable elementary propositions.

(The conclusion of the second syllogism.)

Min. prem.: $\sim q$ is a variable elementary proposition

(Another primitive proposition which is presupposed but not expressed.)

Canon: Any value of a variable may be substituted for the variable, provided it is done systematically.

(The same canon as that of the second syllogism.)

Validat. prop.: The canon of the substitution of variables is correctly applied to this syllogism.

(Proved by inspection.)

Concl.: $\vdash \sim p$ may be taken as a value of q , in a proposition containing variable elementary propositions.

Sixth syllogism.

Maj. prem.: $p \supset q . = . \sim p \vee q$ Df

(*Principia* *1.01)

Min. prem.: $\vdash \cdot \sim p$ may be taken as a value of q , in a proposition containing variable elementary propositions.

(The conclusion of the fifth syllogism.)

Canon: Any value of a variable may be substituted for the variable, provided it is done systematically.

(The same canon as that of the second syllogism.)

Validat. prop.: The canon of the substitution of values is correctly applied to this syllogism.

(Proved by inspection.)

Concl.: $p \supset \sim p \cdot = \cdot \sim p \vee \sim p$ Df

(The 'Df' must be retained here to complete the meaning of the sign $=$, although this proposition is not itself a definition.)

Seventh syllogism.

Maj. prem.: $\vdash : \sim p \vee \sim p \cdot \supset \cdot \sim p$

(Demonstrated by the fourth syllogism.)

Min. prem.: $p \supset \sim p \cdot = \cdot \sim p \vee \sim p$ Df

(Demonstrated in the sixth syllogism.)

Canon: A definiendum may be substituted for its definiens.

(Another important primitive proposition used throughout the *Principia*, but *nowhere expressed*.)

Validat. prop.: The canon of the substitution of the parts of a definition is applied correctly to this syllogism.

(Proved by inspection.)

Concl.: $\vdash : p \supset \sim p \cdot \supset \cdot \sim p$

Q.E.D.

In this analysis we see that because of their failure to understand that every piece of deductive inference (except immediate inference) requires *five* propositions, the authors of *Principia Mathematica* have omitted the canon of combination in each of the syllogisms contained in the above simple demonstration (except in the first syllogism). Failure to analyze the minor premises resulted in the omission of three more primitive propositions. We thus see that the list of primitive propositions of the *Principia* is far from complete. It is not invariably the case in the demonstrations of the *Principia* that the canon is omitted; sometimes the authors see that it is necessary, as in the last step in the demonstration of *2.06, where they give

$[(1) \cdot (2) \cdot *1 \cdot 11]$; here (1) and (2) are the premises, and $*1 \cdot 11$ is the canon.¹⁹ The authors take the practical attitude of attempting to reach a demonstrated conclusion with the minimum of effort but they sacrifice logical rigor in so doing. Such a practical attitude is quite justified in a mathematical work which aims to deduce mathematical propositions from their logical foundations, but the too exclusive preoccupation by that attitude prevented the authors from stating completely the primitive propositions upon which their magnificent system rests, although they explicitly made an attempt to do so. The only way in which an adequate enumeration of the primitive propositions of such a system as *Principia Mathematica* could be made and logical rigor attained, would be to recognize the syllogistic character of each step of the reasoning, and to search for all the propositions implied in each step.

¹⁹ Because of (1) the non-deductive character of the proof of a validating proposition, and (2) because no two validating propositions are identical, but each one is a singular proposition which applies only to 'this syllogism', and (3) because the validating proposition merely guarantees the formal validity of the reasoning, the omission of the validating propositions from the list of presupposed propositions of a system like that of the *Principia* would be no loss, provided that these propositions were clearly understood, and that it was clearly realized that their proof was by a non-deductive method. But the material necessary for the proof of these validating propositions, the definitions of different types of syllogisms, of the types of propositions used in each kind of syllogism, the types of terms and relations, etc. in each kind of syllogism, etc., all of which are now either omitted or tucked away in the prolegomena, should be explicitly provided. It is probably the dim realization of the necessity of stating the characteristics of different kinds of propositions which induced the authors of the *Principia* to spend so much time upon a prolegomena which did not seem to be required in their demonstration, but which is now shown to be essential.

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THE RELATION OF MALEBRANCHE AND LEIBNIZ ON QUESTIONS IN CARTESIAN PHYSICS

IT is well known that Malebranche and Leibniz corresponded over a period of years and that a large part of this correspondence was on the question of the validity of Cartesian physics. It is also well known that as a result of this correspondence Malebranche came to regard Descartes' principle of the conservation of motion as false. Facts did not appear to substantiate the principle and Malebranche came to acknowledge the existence of the conflict between fact and this particular theory. It is, nevertheless, a legitimate question as to how far Malebranche, in making this concession to Leibniz, deserted the principles of Descartes. As a matter of fact, Leibniz's triumph appears to have been moderate. The concessions of Malebranche appear to have stopped here; nothing more important was admitted than that this single Cartesian principle is erroneous.

There are, however, differences of opinion on this point. Malebranche has been commended for the advance he made beyond the principles of Descartes. Cassirer writes that "within the Cartesian school he is the first who has completed the transition from the laws of impact of Descartes to the Leibnizian living force."¹ It is not immediately evident what this transition should mean. Cas-

¹ *Erkenntnisproblem*, Vol. I, p. 481.

sirer here refers explicitly to the efforts of Malebranche to deduce the laws of motion from first principles. The first principles, however, seem to be those of Cartesian physics, and a transition to a law of Leibnizian dynamics is, on this basis, difficult to effect. And it is difficult to conceive how the transition is otherwise to be accomplished than by accepting the *vis viva* as the true measure of force, by denying the absolute distinction between motion and rest, and by acknowledging the importance of the principle of continuity in the formulation of the laws of motion: in short, by becoming a Leibnizian in metaphysics.

But facts indicate that Malebranche was as far removed from the fundamental principles of Leibniz at the end of his revision of Descartes as he was at the beginning. His desertion of the Cartesian account of physical occurrences does not appear to have been very marked. A consideration of the relation of Malebranche and Leibniz, so far as the controversy over Cartesian physics is concerned, may render such a conclusion as this plausible.

Against the principles of Descartes Leibniz urged several cogent objections, the fallacious character of the principle of conservation being of less importance than the rest. The main objections are these, that Descartes' measure of force is not the true measure, that the foundations of his physics leave no place for absolute motion, and finally, that these foundations ignore the principle of continuity, so important in geometry. It is interesting to note that it was during the early part of his controversy with Malebranche that Leibniz first wrote on the importance of this principle. "It is a remarkable thing," he declares in a letter to Arnauld, "to see that almost all of Descartes' laws of motion conflict with this principle, which I hold to be as infallible in physics as it is in geometry, because the Author of things acts as a perfect geometer. If I reply

to Father Malebranche it will principally be in order to point out the above-mentioned principle, which is of great utility and has not yet, so far as I know, been generally considered.”² The reply was made in the same year.³ An illustration of the manner in which Descartes’ laws of motion conflict with the principle of continuity may be found in the first and second laws. The first states that if two bodies of equal mass and velocity collide they rebound and retrograde with their original velocity. This follows from the principle of the conservation of momentum. The second states that if one of the bodies possesses a mass greater by an infinitesimal amount, the smaller will rebound and the larger will continue in its original direction.

Had Malebranche taken the law of continuity for a first principle, the foundations of his dynamics would have been removed. Incidentally his metaphysics would have become invalid, since it states that the essence of matter is extension and that nature is fundamentally a continuum. The absolute distinction between motion and rest would no longer be valid; as a consequence force could not be defined in terms of translatory motion, as the product of the mass and the velocity; in addition, motion could not be defined in terms of the change of spatial position, inasmuch as a body apparently at rest does not manifest this change. And, finally, these results would necessitate the rejection of the theory that the essence of matter is extension, since more would be involved in the conceptions of force and motion than geometry provides.

Fortunately for the consistency of his system, the force of the law evaded him completely. He contended that all of the discrepancies in Descartes’ laws of motion could be eliminated solely by a consistent application of the principle

² Gerhard Ed., *Bd. II*, pp. 133-134.

³ *Nouvelles de la République des Lettres*, Vol. 19, 1716.

that the essence of matter is extension.⁴ This involves a break with Leibniz's principle, for, as he insisted, the great inconsistency of Descartes lay in his supposing that bodies at rest possess a force of inertia. Malebranche could scarcely, on this basis, have been profoundly influenced by Leibniz.

When Leibniz pointed out to Malebranche that the principle of conservation of motion, as that principle is found in Descartes, is erroneous, the whole of Cartesian physics was implicated in the attack. Descartes maintained that the force of a physical system is to be measured in terms of the quantity of motion. The quantity of motion is momentum, expressed by the symbols Mv , and is the actual motion of a body measured in terms of time. The quantity of motion in the universe remains constant, the loss of momentum of one body being accompanied by the increase in the momentum of another. Now motion itself Descartes defined in terms of the change of position; it is the change of position measured by time. A vector would adequately express the nature of motion in Cartesian dynamics had Descartes included direction as an integral part of motion, and, therefore, of force. But Descartes did not include direction, largely, one may suppose, because by defining motion in terms of the change of position the concept of the direction of this change is not necessarily included. Accordingly Descartes' dynamics could contain the proposition that a change of the direction of motion is not accompanied by an expenditure of physical force. It also follows from the definition of motion that force itself will be reduced to spatial terms. It is not the work done by a body, but only the product of the latter's mass and velocity, its actual motion. Malebranche originally ac-

⁴ *Ibid.*

cepted both the definition of motion and force, and the law of the conservation of motion.

Leibniz, on the other hand, maintained that the true measure of force, is the *vis viva*, thus adopting a principle of Huyghens. Force is defined in terms of work done, is given by the symbols Mv^2 , and is considered the effect of a moving body measured in terms of the distance of its action. The motion Leibniz appears to have had in mind is the motion of a freely falling body. Therefore, the distance through which it falls is an integral part of its motion, and, consequently, is a measure of the force that the motion generates. In other words, the motion that Leibniz was considering is inseparable from gravitation. Distance and direction are essential parts in its conception. Leibniz could thus deduce the law that a change in the direction of a moving body is accompanied by the action of physical forces. And what, philosophically, is more important, the distance that is here involved in motion is a relative distance, a relation among physical masses. Thus it would follow that to the extent in which motion is defined in spatial terms, that is, in terms of the change of position, motion is defined in terms that are relative. Motion regarded as a change of position will, therefore, not be absolute. Cartesian mechanics, Leibniz contended, in defining motion in terms of position leaves all motion relative. This particular objection is not, however, valid, although it is a consequence of defining motion in terms of a freely falling body. Motion in Cartesian dynamics, ignoring the fact that, if the essence of matter is extension, matter is a plenum, is the motion of a physical mass alone in the universe. That space should be essentially a relation of masses possesses no meaning on this basis. Position cannot be otherwise than absolute, if motion is to be defined

at all. In fact the issue between Leibniz and Descartes is the question of the relation between uniform and accelerated motion, and whether they can be defined by the same fundamental principles of mechanics, a question answered by the general theory of relativity. But for Leibniz motion that is absolute, not relative, must be defined as an expression of force, and the motion of a body regarded as the change of position is only a quantitative measurement of this force.

The arguments used by Leibniz in behalf of the *vis viva* as the true measure of force are well known. Only two need be mentioned here. In the first place, the quantity of *vis viva* in the universe may be regarded as constant, whereas the quantity of motion, as defined by Descartes, is not constant. Leibniz employed as a proof that the quantity of motion cannot be regarded as constant, the instance of a falling body. The velocity acquired by a falling body produces a force capable of raising the body to the height from which it fell. Assuming that the same force is required to raise a body of the mass M to the height $4h$ as to raise a body of the mass $4M$ to the height h , it must follow, since the velocity in the first case is only twice that of the second, that Mv^2 , not Mv is the measure of force. The law of the conservation of motion fails to meet this case. According to Descartes' law, a body of the mass $4M$ with velocity of 1 degree, on colliding with a body of the mass Mv , transmits to the latter, assuming it to be at rest, a velocity of 4 degrees. It would appear then that on the Cartesian principle the same force necessary to raise a body of the mass $4M$ to the height h , would raise a body of the mass M to the height $4h$. With the fall of the second mass a force greater than that required to raise it would be generated. The quantity of motion could not be conserved.

The second argument for the *vis viva* that Leibniz mentioned to Malebranche, is derived from the law of continuity. If motion is defined in terms of force and not in terms of momentum, the absolute distinction between motion and rest need not exist. The distinction is one of kind rather than one of degree only when motion is defined as the change of position. In other words, a qualitative distinction occurs only when motion and rest are relative, not absolute. In addition a body at rest manifests inertia, and, therefore, force. Rest may be defined as the minimum of motion.

Leibniz finally succeeded in convincing Malebranche that Descartes' principle of the conservation of motion is invalid. Empirical evidence indicated the contrary; and Malebranche also came to argue that if two perfectly inelastic bodies of equal mass and of equal and opposite velocities collide, both bodies will lose their entire momentum.⁵ The quantity of motion is not in this instance conserved, and although perfectly inelastic bodies do not exist in the universe, the law, to possess significance, must apply to any case that may be clearly formulated.

But Malebranche appears to have conceded to Leibniz nothing more than that Descartes' law of the conservation of motion does not stand without qualifications. He retained the Cartesian measure of force. This fact is clearly indicated by the tables for the calculation of motion formulated after his concession to Leibniz, and by the absolute distinction that Malebranche made between motion and rest.⁶ The distinction follows from the definition of motion in spatial terms. The motion Malebranche continued to define was not the motion of a falling body, but a mass changing its position. The validity of the conception of

⁵ *Lois générales de la communication des mouvements*, Ed. by Bouiller, p. 200.

⁶ *Ibid*, pp. 195, 197.

gravitational mass Malebranche denied, so that the motion of a falling body must be interpreted in terms of inertial masses and velocity. Force is the quantity of actual motion, not the *vis viva*. Malebranche was thus confronted with a difficulty. If a physical system is to be a system in which force is not destroyed and to which the principles of rational dynamics is applicable, some meaning must yet be found for the conservation of motion. To meet the difficulty Malebranche formulated the principle that in an isolated physical system momentum may be regarded as constant provided all the velocities in a given direction be taken as positive and in the opposite direction as negative.⁷ The quantity of motion then remains invariable. Thus, if the system contain two bodies of equal mass and of equal and opposite velocities, the quantity of motion in the system will be zero before and after the impact. Descartes' principle, Malebranche supposed, may be regarded as valid if taken with the above arbitrary modification. For Malebranche, then, nature is a physical system in which all causes are moving particles or molar bodies, no force exists but actual motion, and all motion is defined in terms of the change of position.

All other objections to the Cartesian laws of motion, Malebranche argued, could be met if Descartes' principles were carried to their logical conclusion. Descartes had regarded rest as a species of force, a force manifested in inertia and the solidity of bodies. But rest cannot be a force, if force is defined in terms of momentum and if extension is the essence of matter.⁸ Extension contains no concept of force; force can arise only from a successive change of spatial relations. Therefore, Malebranche correctly maintained, motion on the principle of Descartes is

⁷ *Ibid.*, p. 198.

⁸ *Ibid.*, p. 195.

to be the sole cause of all physical phenomena, of the phenomena of the inertia of bodies at rest, solidity, and even of gravitation, which Malebranche argued, could not be explained in terms of action at a distance. Malebranche was thus led to his hypothesis of the "tourbillons," minute, rapidly moving vortices of matter, a hypothesis that need not concern us here. It was, however, formulated for the sole purpose of explaining the above phenomena in terms of motion. Malebranche sometimes assumed that a moving body is endowed with a force, a property capable of differentiating it from a body at rest.⁹ He was scarcely entitled to this conclusion. If matter is extension, a body in motion in no way differs from one at rest, a consideration that Leibniz was never averse to pointing out.

A more cogent objection to the principles of Cartesian physics may, however, be formulated. The objection of Leibniz that Cartesian physics renders motion relative has already been mentioned. It has been pointed out that the objection, as it stands, is invalid. The valid objection to Cartesian physics is not that it leaves motion relative, but that on its own principles, it deprives kinematic motion of its importance as a physical explanation and involves itself in a contradiction. Malebranche, in remaining loyal to Descartes, was obliged to support two incompatible principles.

In the first place, since force arises only from the motion of material particles, motion is the only real cause of changes in the physical world. The concepts of mass and velocity, properties of discrete material entities, are the data at hand. Accordingly, the motion of matter should be an ultimate and irreducible characteristic of any

⁹ *De la Recherche de la Vérité*, Ed. by Bouiller, Part II, p. 166.

physical process, the terms providing an explanation of the process.

In the second place, if motion is defined in terms of space, the spatial structure of relations must be regarded as independent of matter. Space cannot otherwise serve as a referent. Therefore the ordering relations are independent of the things that are ordered; they are relations composing a three-dimensional Euclidean structure, and the entities they relate are geometrical entities, ultimately points, not discontinuous and moving particles of matter. Space, therefore, expresses a general property of nature not found in these material particles or in observed moving bodies. The characteristic of physical nature that is capable of providing geometrical relations is its extension or its continuity. Nature must, therefore, be in essence a continuum and geometry is an expression of this fact.

The difficulty of forming a consistent theory of nature on these two principles is at once evident. If motion is defined in terms of space, so that the properties of space are independent of matter, motion will inevitably resolve itself into a set of static relations of geometrical elements. Matter will acquire the properties of the relations; since a particle is infinitely divisible, a particle will be reduced to a point and its relations to relations between points. There occurs no change of relations in such a system; and the physical meaning for dynamical effects vanishes along with an absolute distinction between motion and rest. Moreover, since both matter and motion are exhausted by the properties of the relations and the relations are derived from the continuum, matter and motion become, ultimately, properties of the continuum. Therefore, the properties of the continuum, not matter in motion, should provide the real physical explanation of any physical occur-

rence. Motion will not be an irreducible change of relations of discrete objects and atomicity will not be a fundamental property of any physical process.

This difficulty inherent in Cartesian physics is of importance. It is a difficulty that finds its solution in a contemporary theory of nature, namely the theory of Whitehead. Whitehead's theory of nature is a result of the special theory of relativity, and by means of its basic principles provides a solution to problems raised by the general theory. Now it is interesting to observe that in Whitehead there occur two principles identical with those embodied in Cartesian dynamics. The consequences that logically follow from those in Whitehead's system are found in Descartes. It is one of the many merits of Whitehead's account of physical processes to have rendered these principles consistent. The principles are, first, that the metrical properties of the relations of space and time are independent of matter; secondly, that nature is, as a consequence, ultimately a continuum, since the characteristics of nature expressed by a space-time geometry are not found in the discreteness and atomicity associated with moving matter. And it follows that all physical occurrences are to be explained in terms of the properties of the continuum.

The general theory of relativity postulates the existence of an explicit relation between the metrical properties of space-time and matter. Matter and the physical quantities determine, according to Einstein, the metrical properties of the region. The ordering relations are not, in other words, independent of the entities that are ordered. The special theory of relativity provides the relativity of space and time coordinates in virtue of which physical measurement is conducted. The general theory enables the relativity of measurement to apply not only to Galilean frames

of reference but to frames that are non-Galilean, and this result, according to the original papers of Einstein, necessitates a variable metric of space-time. One factor in determining the metrical properties of any region is the distribution and density of matter in the region.

The conclusion of the general theory is not, however, free from difficulties. Two questions of philosophical importance are raised. The first concerns measurement, and the second, kinematic motion. The two problems are analogous. If what is physically real is synonymous with measured quantities, the question arises as to what conditions of nature must be present to render measurement possible. And, likewise, if motion is a genuine physical property, the question arises as to what other properties of nature must be real in order that motion be possible. The problem of motion is partly a logical problem. Empirically, it is known what is meant by a moving body. But the concept is taken up in theory, where it requires an explicit and clear definition.

If matter is kinematic in nature, as the kinetic-atomic theory implies, if the dynamical theories of heat and gases is to obtain, the properties of space-time are conditioned by matter in motion. Space cannot in such a system serve as a referent for motion, since it is itself an expression of the properties of matter, one of which is motion. On the other hand, if motion is defined as the change of relations of physical entities, the question at once arises as to the manner in which these entities are distinguished. Relative motion cannot possess a clearly defined meaning until the individuality of the terms of the relation is clearly established. The motion of one material particle cannot be defined as relative to another unless some meaning exists for the differentiation of the particles; and for motion to be genuinely relative, the same entity must carry its identity

from one co-ordinate system to another, so that it may be taken as at rest. Thus it is necessary to find some meaning for the discontinuity and identity of the physical bodies. The absolute spatial structure of classical mechanics was a simple and logical instrument for achieving the desired result. A point or a path described by a moving particle, a molecule in a gas, for example, was not defined in terms of matter, but was an element in the independent spatial structure. A particle could be located at a point or its individuality established by the uniqueness of its path. In this respect absolute space with its independent structure was as much a logical requirement in classical mechanics for unambiguously defining atomic motion as for providing the unique referent for accelerated motion. Thus the motions of material particles could be given an explicit meaning.

Now if the implication of the general theory are valid, the properties of space can no more serve to define the uniqueness of the kinematic elements moving relatively to one another than it can define their motion. Immediately observed bodies are differentiated without difficulty by observable relations and properties. There exists no danger of confusing the earth and the sun or a body moving to the earth. But if the kinetic atomic theory of matter is valid, the properties of observed bodies resolve themselves into properties of the unobserved. The motions of the elements of a gas may move with reference to the sides of the vessel or the table on which it rests, or the earth. But if the implications of the theory are developed, the sides of the vessel, its support, and the earth resolve themselves into the motions of unobserved entities, and it is the relative motion of such terms as these that must, in the end, be clearly defined. Such relative motion as this the general theory appears to leave ambiguous.

Whitehead's theory attempts to meet this difficulty by rendering the structure of space-time relations independent of matter. Metrical properties are not an expression of the properties of physical entities. Space may then provide the referent for motion, and motion and rest be defined in terms of position.¹⁰ A four-dimensional geometry expresses the properties of nature not found in moving particles of matter. They express the fact that physical nature is fundamentally a continuum, and the relations along with the physical entities are adjectival properties of the continuum.

Thus, as in the system of Descartes, motion is not an ultimate and irreducible physical process. The temperature and pressure of a gas, or the variations of the potentials in an electro-magnetic field, are not phenomena arising from the motions or molecules of electrons; they possess their ultimate explanation in terms of the continuum of events; and events do not move, and this result applies to all physical processes in which motion is usually taken to be a cause. Whitehead's system is thus consistent.

In conclusion one may say that if nature is a continuum whose properties provide the relations which, in turn, are independent of matter, then Whitehead's system must be regarded as valid. The deductions following from it would appear to be unavoidable. The motion of matter, no more than the occurrence of sounds and colors, will be an ultimate physical process, or the final terms in which an explanation of physical occurrences is to be given. The explanation comes in terms of events which are not point-instants or elements of a geometrical structure. On the

¹⁰ To contain relative motion, nature must contain various spaces, so that a body moving in one space may be at rest in another. The individuality of the entities is not defined in terms of space, but in terms of the properties of the continuum, that is, events, so that the same entity may be said to belong to different spaces.

other hand, if physical occurrences are genuinely kinetic-atomic in essence, as the foundations of the general theory suggests, then space-time must possess its basis in moving matter. The geometrical relations are an expression of this fact. Motion is not then a change of spatial relations or definable in terms of space. In this respect the dynamics of Leibniz is more in accord with the implications of the general theory of relativity than the dynamics of Descartes and Malebranche, and in this respect Leibniz' objection that Cartesian dynamics leaves motion only relative holds.

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WHERE IGNORANCE IS BLISS

TRUTH, we are assured, is for man the supreme value. Of all the things he has sought and has prized, truth is that which he has held most dear. To this alone will men bow the knee. Humanity through all the ages has peered through sweat-dimmed eyes that haply man might glimpse Truth.

This is the legend concerning man and Truth. And it is a legend. For the gods, indeed, Truth may be the supreme good. In their distant realms of being, the gods may contemplate the essences of things, flames that burn unwastingly and eternally. So Plato and Aristotle would assure us. And Santayana, whose metaphor I have had in mind, would assent. But how can this be asserted of man?

Is it a truth that men, throughout all history, have taken Truth as the highest good? Did men, even in the earliest ages, yearn for the light of Truth? It is tempting to think that the beliefs of the savage are anticipations of civilization's highest insights. Nothing seems more apparent than a universal and persistent devotion to Truth—and yet there is little that is more false. Consider the historical facts, it may be urged. No wars have been more terrible than those that have been waged in the cause of the Truth. No rallying cry has been more effective than the call to defend the Truth. No faith has been more

stubbornly held than this, that the Truth will finally prevail. The procession of those who have been martyrs to the Truth is magnificently long. No loyalties have been more unswerving. Everywhere, with all races, in all climes and in every age, savage and civilized alike have chosen the destruction of earthly goods, and even of life itself, rather than forsake the Truth. To be sceptical concerning this, the sentimentalist may urge, is more than heresy, if there can be anything more debased, for it is disloyalty to mankind.

Nevertheless there is room here for scepticism. Turn again to history. It is strewn thickly with the wrecks of ideas. The history of mind is largely the history of cherished errors. Discovery has been the discovery of falsity. The alleged ruthlessness with which Nature destroys the unfit, its wastefulness, seems to have a parallel in the history of mind. Men have winnowed the wheat from the chaff—but how pathetically meager the harvest! And these falsities—what high endeavours they determined, and what intense loyalties have they commanded! What idea so monstrous that is has gained no believers? Mountebanks, charlatans, sorcerers, astrologers, diviners, wonder-workers, demagogues, false prophets—history is replete with these purveyors of illusion. Ten thousand forms of magic have been accepted. Upon amulets, charms, talismans, soothsayers, upon those who read the entrails of animals and those who watch the flight of birds, have men depended. The magic cap that makes the wearer invisible has hidden man from himself. The occult virtues and concealed menaces of things have been relied upon. No evidence has been so highly regarded as that of miracles, of sacred duel, and of votive tablets hung in temples. The discovery of superstition occurred but yesterday, where, indeed, it has occurred. Of all bodies of truth, religious

truths have been revered in the highest degree. Yet many gods have come, have secured impassioned allegiance, and of some of them we now learn only when archaeologists have labored with pick and shovel.

All this, it may be said in horrified protest, is an unseemly and mocking paradox. Let us defend men by recognizing that they have clung to error but only because they believed that they were clinging to the truth. That which is false, when known as false, has never commanded service. To be mistaken,—so runs the defense—to cherish un-truth because one whole-heartedly believes it to be the truth, is itself proof that Truth has been taken as the supreme good. Faith that the truth will prevail—what is this but devotion to Truth as the highest value? In his most monstrous adorations, man has demonstrated that of all things he yearns first for Truth. To hold falsehood for Truth, this is the human tragedy. But even in the midst of this tragedy, since it is to Truth and not to error that men do homage, men are like the gods. For gods and men alike revere Truth—but only men can be mistaken. Revised and re-interpreted in this way man's valuation of the Truth is affirmed to be no legend but the golden thread running throughout his history. To think otherwise is mockery and profanation.

It remains, however, a legend. Moreover, it is not mockery, but the pursuit of Truth, to maintain it. For Truth and the truth may be, in the human scheme of things, radically unlike. Here is no new, but an old, distinction; when we forget it, history itself becomes a legend. Faith that Truth will prevail is in no way to be confounded with the faith that *the* truth will prevail. The former is rare. But every warring sect—in science, in art, in morals, and in religion—has the faith that *its* truth is Truth, and that *its* truth will prevail. Loyalty to Truth,

however, is one thing, and loyalty to *the* truth is another. Only when these distinctions have become realities for intellect can mind adopt the pursuit of Truth as its foremost enterprise. Truth can be established as the goal of mind and its highest good only when mind has become conscious of its proper vocation. But when it faces the realities of that vocation, ignorance is perceived to be man's most important practical achievement.

To be ignorant is one thing; to know that we are ignorant is a radically different state of mind. Socrates insists upon this to every generation that will take heed. To be ignorant, simply not to know while not knowing that we do not know—this is a sheerly negative ignorance. It is not a fruitful condition of mind. Of course, this negative ignorance is only the other side of a knowingness that is equally unsuspected. We are likely to say of the uneducated or of the savage, that they are ignorant. But in what sense can they be so called? A blind man does not know colours; he does not even know that colours are not tastes. There is for him no colour world at all. Thus the sciences represent enterprises, labors, conceptions, methods, problems, aims and ideals that simply do not exist for the primitive mind. Nothing is more useful than an ignorance of which our mind is aware. But the negative ignorance of the savage is not useful. There is no comparison whatever between the latter and that ignorance of chemistry which a musician may admit, or that ignorance of Greek that the geologist cheerfully acknowledges. If we desire to picture the savage mind in a positive way, we can say neither that he is ignorant nor that he knows, save in emptily negative senses of the words. In point of fact, the savage may possess admirable skill in various forms of handicraft. He may "know" what wood to use for bow, what for spear, and how to

hollow out a boat. He may "know" how to weave fabrics or how to poison his dart. But in a fruitful and dynamic sense, he really does not know these things—he merely does them. He gathers from this skill no stimulus to new inventions, no impulse to the acquisition of new and higher skill. He is not ignorant, let us say, of the true shape of the earth. He may possess a myth in the telling of which he delights—a myth that recounts how the gods made the floor of earth and the lights of heaven. But myth cannot be represented as the satisfaction of an inquiring mind. The myth is the expression of a mentality that knows no discontent and so can have no intellectual satisfactions. Nothing can be the satisfaction of a desire where there is no desire. "The shape of the earth" is a phrase implying a problem, distinctions, uncertainties, possibilities to be distinguished. But the savage has thought of no such problem. Savages are certainly not children when they are grown-ups. All the more are they unlike our own children, whose minds are marked by an ever-stimulated curiosity leading to the incessant questioning that harasses parents. The mark of the savage mind is a contentment that precedes, rather than follows, a process of questioning and answering. Were it otherwise there would be no savage mind. It even required the Devil, with all his guile, to lead Adam and Eve to distinguish between good and evil. To represent the savage as discovering by research his bow and arrow, and seeking improvements and new weapons, as an engineer with an engine, is nature-faking on an outrageous scale. The savage may appreciate lucky finds. In his world, his magical world, such things do happen, as do storms and pestilence and food and famine. Beyond that he cannot go, and be a savage.

Thus the savage mind is both ignorant and knowing, in an essentially negative sense. It is a mind that has

never disclosed its ignorance to itself. It has not discovered that discovery is possible. Being ignorant of the very meaning of knowledge, it has never felt the pitiful limitations of mind. Only a great mind, thoroughly awakened, can recognize the frailty of mind. Like the man born blind, the savage feels that his path is strangely difficult; but again like the man born blind he cannot realize how much smoother the path would be could he but see. How shall a blind man comprehend the value of a vision that he has never had—how shall he even comprehend that even vision has its illusions? How can the savage take Truth for his supreme good and the pursuit of Truth for his task?

The discovery of ignorance is, beyond all others, that which is practically the most fruitful. It is true that, in making this discovery, our knowledge is disclosed to us. So meager, however, is this knowledge that, for all practical purposes, the disclosure is concerned not with knowledge but with the possibility of knowledge. Even Socrates could find only this, that he did not know. Socrates thus stands as a symbol of the great crisis for mankind and for every man. In this crisis, ignorance and knowledge receive a positive meaning. This ignorance, this Socratic ignorance, is qualitatively a new thing. An awakening—but it is also a transformation. Its counterpart is the realization that mind has a vocation, and that this vocation is the discovery of Truth. New ideals emerge—of accuracy, of methodical activity, of self-criticism, of tolerance, and of loves and loyalties that are universal. At this point alone does man become to himself a riddle and a paradox. A creature of earth, he discerns a cosmic order. The Sphinx is not the riddle of man—for the Sphinx remains part beast and part man. Only when reason reckons with itself does the beast become man.

Above all it must be acknowledged that only in this crisis can Truth become the supreme value. Truth for the gods, perhaps, implies no pursuit and no activity, but only a serene and marvellously rich quiescence. This cannot be said of man. Truth for man must imply the pursuit of Truth, and this must signify a task with illimitable aims. It is an adventure, and in it many will-o'-the-wisps will lead astray. But so long as Truth is recognized as meaningful adventure, we shall not remain astray. We shall suspect of every light that it may be a will-o'-the-wisp: but we shall be humbly cautious lest we mistake a beacon for a will-o'-the-wisp.

The consciousness of ignorance is thus the pre-condition of all discovery. A savage can set forth on no voyages of discovery. A Columbus, knowing his ignorance and suspecting that so much alleged knowledge is ignorance, may venture and find. Thus mind becomes dynamic. It is led to perceive that an ideal of Truth is inseparable from an ideal of the Pursuit of Truth. Mind notes that even truths, all those sets of beliefs that one or another group of men acclaim as *the* truth, must be subjected to ideals defining the pursuit of Truth. This implies scepticism—as an agency for its own dis-establishment. For until the human mind has compassed all Truth—if, indeed, there can be any meaning in such an expression—there must remain the residual possibility of error in all that is acclaimed as *the* truth. Only in this way is growth possible, for growth is not a mere addition but a process of internal reorganization.

Now it may be seen why the account of man as taking Truth to be the supreme value of life is a legend. Man has cherished *the* truth; has cast it aside, only again to hold a new thing as *the* truth. The crisis of the discovery of ignorance having passed, new ideas having been

won, men tend to forsake the enterprise. First results are accepted as final. Passion gives incalculable importance to these achievements of immaturity. Ideas are removed from their setting in the process of inquiry. As instruments in the pursuit of Truth they were flexible. When the glow of adventure is lost, sloth gives fixity to vital movement. Ideas are set up as prizes for a race that is ended. With this distortion mind loses its impetus. The first-fruits of inquiry assume the status of *the* truth. Stubborn defense takes the place of criticism and discovery. *The* truth is cherished and the pursuit of Truth languishes.

In this way, at a new level, we come to lose that pricking consciousness of ignorance which preconditioned the revelation of new gods. The gods indeed become solidified into idols. Inspiration gives way to oracular utterance. The letter that kills is preferred to the spirit that lives. Losing this consciousness of ignorance, we lose also our awareness of the very meaning of Truth. There is no reversion to the condition of the savage mind. Salvation, once we have been expelled from the Garden of Eden, lies in the attainment of Heaven, not in seeking re-entrance into Eden. For salvation men must seek. Whatever else it may mean, for men salvation demands unending effort. We may not know when we have won salvation, but we do know when we have *not* won it. To be convinced that we are saved, to rest assured that salvation lies within our grasp, is to imperil our souls. This is Phariseeism. But when human beings, in the name of *the* truth, would bring to a close the search for Truth, there again is Phariseeism. It is well to remember that of the Pharisee alone did the Galilean despair.

This new and unholy contentment of mind that arises when Truth is confounded with *the* truth, and the spread-

ing of *the* truth is identified with devotion to Truth, is the satisfaction of a desire that seeks tyranny and not freedom. Intellect is reduced to the service of desire—but not in order that desire may be liberalized. Knowledge is taken for granted, without even a recognition of the challenge that accompanies the claim to be knowledge. In this way the most startling contrast of history comes into being. Men make a general admission of ignorance as a formal gesture—but do not make of the admission an operative principle. Every generation discovers in *the* truth of its predecessors many errors and illusions,—and yet scarcely suspects the future estimate of its own mind. For the later generation the superstitions of the earlier time are easily recognizable as superstitions—but that earlier age shows an astonishing inability to make this discovery for itself. The historian shows us that groups of men have clung with equally passionate and unquestioning loyalty to quite contradictory sets of “truths.” First one thing and then another is cherished as the highest truth, the final truth, the truth. In this sense, it must be admitted, men have affirmed that truth is of all goods that which is first. But what do the facts suggest? They indicate that the way in which men are so often loyal to the truth is the chief obstacle to the discovery of Truth.

The race of men becomes divided into warring camps. In the very nature of the case there can be no pact which will bring all men into peace one with another. If each party possess *the* truth, and yet each has a truth quite opposed to that of every other, how can all parties be persuaded to the truth of one party? If peace be attained at all in these conditions, it can be only the peace of subjugation. Since in every camp there is confidence in righteousness of cause, inflexibility must oppose inflexibility. Thus the paradox arises: it is loyalty to the truth that divided

men; it is conviction of knowledge that sets them at war one with another. In such circumstances there can be but one way to brotherhood—and that way lies through the consciousness of ignorance. We must become sceptical, not of Truth, but of what other men call the truth, and still more of what we ourselves call by that name. In the moral world—for this there is high authority—the recognition of our unworthiness is the prime condition of charity and of worth. But there is only one world, not one for morality and another for thought. In all the fields of human interest, be it of art or science or religion, possession is a seeking. “Where ignorance is bliss, ’tis folly to be wise”—this is surely the maxim of animality, not for humanity. Ignorance, indeed, is not bliss, but the precondition of bliss; and therefore it is folly to pretend to a wisdom that we do not possess.

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SENSATIONS AND THE CONSTANCY HYPOTHESIS

MR. DURANT DRAKE accuses me of using an argument against the existence of "sensations" that rests on a confusion. I think I can show that his criticism is due to the deficiencies of my exposition, and not to any inherent confusion in the line of thought; and in so doing I may perhaps make clearer some aspects of the question at issue.

The entity on whose *existence* I was in my paper¹ concerned to cast doubt is a psychic event strictly correlated with—or having a constant relation to—an event in an afferent nerve and brain centre. It was this entity that I was attempting to describe in the definition of "sensations" that is quoted by Mr. Drake.² The definition is in terms of the constancy hypothesis with an account of which I had begun my paper. Anyone who should hold that the constancy hypothesis has no application, must "therefore" hold that there are no "sensations" in the sense defined. It is true that the term *sensations* is used less strictly to mean the irreducible sensory elements in our analysis of sense experience. But it will be found that those who so use the term tend to think of a sensation, and in the last resort to define it, *not* in phenomenological terms, but in terms of its relation to its stimulus. I am struck by the fact that this conception of existing sensations, or "atoms of psychology," creeps into psychology and epistemology in unexpected places, and influences them profoundly. It appears in such problems—or pseudo-problems—as the filling in of the blind spot, the reversal of the retinal image, whether black is a sensation, the "analysis" of the margin of consciousness. It underlies the doctrine of subconscious experi-

¹ "Sensible Appearances, Sense-Data, and Sensations," *Monist*, Vol. XXXIX, pp. 99-120.

² "Sensations and the Constancy Hypothesis," *Monist*, Vol. XXXIX, pp. 473-476.

ence, and the conception of veridical perception in causal theories. The general position taken in my paper is (a) that there is evidence against observable sensations; (b) that the Critical Realists' main argument for the existence of unobservable sensations is open to criticism; and (c) that the history of philosophy explains the belief in both.

I did not, therefore, in defining sensations intend to prejudice the question whether they are, or are not, observable. In Part II, I discussed whether anything that is observable is a sensation. Sensations might be "presentations." I did say, however, that sensations were "hypothetical," and Mr. Drake quotes this as part of the definition, and takes it to be synonymous with *unobservable*. Consequently he finds all arguments against observable entities "beside the point," and my distinction between observable sensations and sense-data "curious." I fear that my assertion that sensations were "hypothetical" was cryptic, and highly misleading. That they were unobservable is not what I meant: I meant to suggest that they were *defined in terms of an hypothesis*—not by reference to observation.

What now is the argument that Mr. Drake finds confused? It is one, he says, in which I conclude that there are no unobservable sensations from evidence that only tends to prove that there are no observable ones. Now my *explicit* argument against unobservable sensations was that they did not explain the mechanism and peculiarities of perception in the manner in which they were assumed to do. But there is also implicit in Part III of my paper—particularly in the opening sentence—the suggestion that the experimental evidence against observable sensations is relevant to Critical Realism. Is this so? Not if the Critical Realists consistently maintain that "sensations are not *discoverable* . . . they are not facts of experience; they are assumed in order to account for the facts of experience."³ If this is Mr. Drake's considered opinion it is welcome, and it is the position towards which Critical Realists have been working. But there are passages in *Mind and Its Place in Nature* that are not, I think, consistent with it. Thus the arguments for the identification of mental and cerebral states to which I referred⁴ do seem to suggest that sensations are observable.⁵ Further it is asserted that in-

³ *The Monist*, Vol. XXXIX, p. 474.

⁴ *Op. cit.*, Vol. XXXIX, p. 109.

⁵ *Mind and Its Place in Nature*, p. 82 et. seq

tropection can be "veridical" and that in this case we are observing "the very events of our inner life."⁶ Mr. Strong holds⁷ that it is possible to observe correctly the intensity, extensity, temporal successiveness and sensibleness of sentience. The more one considers the nature and complexity of neural process the more unlikely this seems. Would Mr. Drake accept it? In so far as it is claimed that when the datum is "referred"—to the self or body—the qualities (*e.g.* intensity) of mental states are observable, I should have supposed that empirical investigation under simple and carefully controlled conditions is relevant. The empirical evidence to which I referred goes to show that the correlation is between the stimulus constellation as a whole and the conscious field as a *whole*. This is not favourable to the doctrine of psychic atoms. Thus, although the evidence against observable sensations may not be relevant to unobserved hypothetical ones, it is not yet clear that it is irrelevant to Critical Realism.

At the end of his discussion Mr. Drake raised the notion of *projection*. I feel in some degree the force of Mr. Drake's contention that long consideration of the facts of bodily adaptation may lead to a belief in sentience and projection. Meantime I cannot see that they involve more than physiological events and *what we are conscious of*, either vaguely or distinctly. Whether such a position can be maintained depends of course on the adoption of a theory of secondary and other qualities alternative to Mr. Drake's view that they are "figments." Such a theory could not, I think, find any clear meaning for Mr. Drake's fundamental axiom that "existentially speaking everything is where it is."

⁶ *Op. cit.*, p. 77.

⁷ *Mind N. S.*, Vol. XXXV, p. 45. Mr. Strong holds that sentience can be "enjoyed." But, I doubt if Mr. Drake has any place in his psychology for enjoyment. He reduces immediate experiences to fused sensations.

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NOTES AND NEWS

The following provisional program has been announced for the Seventh International Congress of Philosophy, to be held at Oxford University, September 1-6, 1930.

DIVISION A. *Metaphysics*—General Session: Are recent advances in physics of metaphysical importance?

Section 1: Can science dispense with the notions of substance and cause?

Section 2: Is a philosophy of history consistent with the facts of history?

Section 3: Must biological processes be either purposive or mechanistic?

Section 4: The relations between metaphysics and religion.

DIVISION B. *Logic and Epistemology*—General Session: The value of recent contributions to logic or phenomenology.

Section 1: The nature of perception and its objects.

Section 2: The nature and source of non-perceptual factors in thinking.

Section 3: The relation of scientific thinking to the ideal of knowledge.

Section 4: Is probability objective?

DIVISION C. *Ethics, Politics and Esthetics*—General Session: The value of ethical and political philosophy as guides in practice.

Section 1: Is the distinction between moral rightness and wrongness ultimate?

Section 2: Is the ground of political obligation always one and the same?

Section 3: Has there been in recent times any substantial change in the conceptions of freedom and responsibility?

Section 4: Recent suggestions in the theory of fine art.

DIVISION D. *History of Philosophy*—General Session: In what respects has philosophy progressed?

Section 1. Ancient philosophy: What is alive and what is dead in the philosophy of classical antiquity?

Section 2. (a) Medieval philosophy: The philosophical problems at issue in the XIIIth and XIVth centuries.

(b) Oriental Philosophy: What contributions have been made to philosophy by eastern philosophers (including Jews and Western Arabs)?

Section 3. Philosophy of the XVIIth and XVIIIth centuries: Is it necessary for students of philosophy to go behind Kant?

Section 4. Philosophy of the XIXth and XXth centuries: Absolutism and the revolt against it.

MEMORIAL TO PROFESSOR L. T. HOBHOUSE

The following communication has recently been issued:

"The recent death of Professor Leonard Hobhouse came as a shock to his friends, who had looked forward to his having a good many years of further work and of development of the unique position which he has held in the study of the social sciences. We feel sure that many of those who directly or indirectly have come into contact with his work will wish to help in the establishment of some Memorial Fund with which his name may be permanently associated, and which may be used to assist in the perpetuation of his influence.

"We accordingly invite subscriptions to such a fund. We hope that those who subscribe may leave us who sign this appeal, as a Committee representative of the many sides of life which Professor Hobhouse touched, to frame a scheme for the Memorial, and to settle at a later date whether any fund raised can be used best for a lectureship, a scholarship or the publication of studies in the social sciences."

This appeal is signed by S. Alexander, W. H. Beveridge, Victor Brandford, H. A. L. Fisher, Morris Ginsberg, G. P. Gooch, J. L. Hammond, J. A. Hobson, Gilbert Murray, Percy Nunn, Herbert Samuel, C. P. Scott, Hubert Llewellyn Smith, Arthur Steel-Maitland, Graham Wallas and Beatrice Webb.

To further the above object the American friends of Professor Hobhouse have formed a committee consisting of Professors John Dewey, Franklin H. Giddings, Robert M. Mac Iver, Charles E. Merriam, William F. Ogburn and Edwin R. A. Seligman. Those who may wish to subscribe to the fund will kindly communicate with the chairman of this committee, Professor Edwin R. A. Seligman, Faculty of Political Science, Columbia University, New York City.

THE MONIST

THE BIFURCATION OF NATURE

I

IN the second chapter of his *Concept of Nature* Professor A. N. Whitehead lays down as the first principle to be guarded in framing this concept that we must avoid vicious bifurcation. Nature is nothing else than the deliverance of sense-awareness. Our sole task is to exhibit in one system the characters and inter-relations of all that is observed.

There reigns in philosophy and in science, he says, an apathetic acquiescence in the conclusion that no coherent account can be given of nature as it is disclosed to us under sense-awareness, without dragging in its relations to mind. But that is for him no part of the business of those whose concern is to develop a concept of nature. So Mr. Whitehead bids us leave to metaphysics the synthesis of the knower and the known. We are to ask nothing about the percipient and restrict our inquiries to that which is perceived. Everything perceived is in nature. We may not pick and choose. All our sense perceptions are in the same boat and must be treated alike. The red glow of the sunset is as much part of nature as are the molecules and electric waves by which men of science would explain the phenomenon. It is for natural philosophy to analyse how these various elements of nature are connected.

This means a refusal to countenance any theory of

"psychic additions" to that which is known in perception. Under traditional treatment, the so-called secondary qualities such as colour, scent, savour, and sound, are regarded as dependent on the percipient mind, leaving to nature only the primary qualities which influence the mind to perceive a lot of things that are not there. Mr. Whitehead's contention is that to drag in the mind as making psychic additions is merely a way of shirking the problem of natural philosophy. That problem is to discuss the relations *inter se* of things known, abstracted from the "bare fact" that they are known.

What Mr. Whitehead protests against is a bifurcation of nature into two systems of reality, which, in so far as they are real, are real in different senses; or into two divisions, namely, the nature apprehended in awareness and the nature which is, in some sense, the cause of awareness. I say "in some sense" because he distinguishes the causation involved in interactions within nature from the causation attributed to the influence of nature on "the alien mind" which, it is said, thereupon perceives things that are thus endowed with qualities that, apart from this endowment with psychic additions, are not there. Mr. Whitehead insists that, for those who have not, under the influence of theory, abandoned an "immediate instinctive attitude," there they are. The nature which is apprehended in awareness holds within it the greenness of the trees, the song of the birds, the warmth of the sun, the hardness of the chairs, and the feel of the velvet.

Such in brief reminder is the argument of the second chapter of the *Concept of Nature*. But in the opening chapter we are told that nature as disclosed in sense-perception is self-contained as against sense-awareness, in addition to being self-contained as against thought. Mr. White-

head expresses this self-containedness of nature by saying that nature is "closed to mind." He adds, however, that this closure of nature does not carry with it any metaphysical doctrine of the disjunction of nature and mind. What then does it mean? It means that in sense-perception nature is disclosed as a complex of entities whose mutual relations are expressible in thought without reference to mind. As Mr. Whitehead puts it: When we are thinking *homogeneously* about nature we are thinking about it without thinking about thought or about sense-awareness; but when we are thinking *heterogeneously* about nature we are thinking about it in conjunction with thinking about such extraneous matters. His plea is for homogeneous thinking.

To this end he bids us concentrate attention on that which is known to us as the "direct deliverance" of sense-awareness. This implies no doubt a relation of mind—broadly speaking the cognitive relation—to "the terminus thus disclosed;" and he does not deny that there are relations to minds of natural entities other than those which are the termini of sense-awareness. Furthermore we are told that since thought is wider than nature there are entities for thought which are not natural entities. In any case it is clear that sense-awareness affords an instance of relatedness. But Mr. Whitehead feels justified in asserting that this cognitive relation makes no difference to nature as disclosed in sense-perception.

For one whose method of treatment is so strictly relational as is Mr. Whitehead's, nature and mind are in some mode of relation. Hence he repudiates any "disjunction." But he no less repudiates any "conjunction" so long as we are thinking homogeneously about nature. What does this mean? I hazard the opinion that under "conjunction" he has in view so-called internal relations,

whereas under "disjunction" the relations are external.

Under internal relatedness a given entity *a* is what it is in its relation to the whole alphabet of other entities; under external relatedness *a* is what it is solely in itself, that is, irrespective of the rest of the alphabet. There is, however, no reason why all the letters of the alphabet should be internally related. There may be ground for excluding, say, *p*, *q*, *r*, as externally related; and these may be psychic or mental. In that case *a* has "additions" in respect of all relations save *p*, *q*, *r*, but none in respect of these relations, that is, no "psychic additions." This I take it to be Mr. Whitehead's position.

II

Let us, however, look a little more closely into Mr. Whitehead's philosophy of nature. We must start with the event as the ultimate unit of natural occurrence on some "epochal occasion." Any event has to do with all that there is, and in particular with all other events. Thus, the actual world is a community of epochal occasions. In the physical world, under this concept of nature, each epochal occasion is a definite and limited physical event, limited as to space and time, but with time-duration as well as with its full spatial dimensions. These epochal occasions are the primary units of the actual community, and the community is composed of its units. But each unit has a "prehensive" relation to every other member of the community, so that each unit is a microcosm representing in itself the entire all-inclusive universe of events.

We have thus within nature a prehensive interfusion of events which may be spoken of in terms of "aspects." There is a reciprocity of aspects, and there is a pattern of aspects. Each event corresponds to two such patterns;

namely the pattern of aspects of other events which it grasps into its own unity, and the pattern of its aspects which other events grasp into their unities. There is thus an intrinsic and an extrinsic reality of an event, namely, the event as in its own prehension and the event as in the prehension of other events. The word which Mr. Whitehead uses for the intrinsic reality of an event is "value."

All this is subject to the doctrine that the relationships of an event are internal. They are intrinsically constitutive of what the event is in itself; but always in conjunction with all other events, since each event is a microcosm representing in itself the entire all-inclusive universe with its plurality of organisms.

The concept of organism is now so familiar as to call for little recapitulation here. The individualised organism is a community of subordinate organisms each of which plays the part of member within the community, but in relation to every other member. The word "member" here emphasises the organic conjunction, subject always to internal relations, but subject also to the concept of substance in the sense implied by the word "community" as naming a synthesis of parts within a whole. The parts, as members, Mr. Whitehead says, are evidently constitutive of the community as a whole. But the whole is evidently constitutive of the part. Here "whole" and "part" are used in the sense which Mr. Whitehead thus characterises: The part is an event which is "extended over" by the other event which is the whole.

III

In his brilliant historical sketch of the progress of thought, technological, scientific, and romantic, Mr. Whitehead says that the nineteenth century, in its last twenty years, closed with one of the dulllest periods since the time

of the First Crusade. Here almost suddenly a pause occurred. But dull as it was, in Mr. Whitehead's opinion, the close of the century was the seed-time of later harvest—the harvest of evolution. During the twenty years pause the main work, he tells us, was the absorption of the doctrine of evolution “as guiding the methodology of all branches of science.” And he regards a thorough-going evolutionary philosophy as inconsistent with materialism. It heralded the advent of organism.

The aboriginal stuff from which a materialistic philosophy starts is, he says, incapable of evolution. So-called evolution, on this theory, is reduced to the rôle of being another word for the description of the changes of the external relations between portions of matter. There is nothing to evolve because “one set of external relations is as good as any other set.” But the whole point of the modern doctrine is the evolution of complex organisms from antecedent states of less complex organisms. The doctrine of evolution thus “cries aloud for a conception of organism” as fundamental in nature. And in Mr. Whitehead's philosophy of nature the concept of organism stands rooted in the unreserved acceptance of internal relations. Amid sundry hard sayings that, I think, is at the root of the matter.

So long as we think homogeneously the whole course of evolution falls within the closed system of nature as disclosed to mind in accordance with the deliverance of sense-awareness. At any rate it is here that we are to seek the foundations of the superstructure of nature. But in discussing this sense-awareness we are not to ask anything about the percipient. We are to deal only with that which is perceived. That, one might suppose, excludes the word “percipient” as applicable in discourse concerning a closed system of nature. But this closed system does, we

are told, include the “percipient *event*” as a natural occurrence. This percipient event is the relevant bodily state of the organism. Thus, as a physical event, it is part of nature and, in conjunction with other physical events, it falls within the scope of evolution. Percipient events are therefore to be discussed in terms of internal relations, otherwise they would not be implicated in the evolutionary process which characterises the advance of organisms within the closed system of nature. In this advance there is passage towards new organisms which are spoken of as emergent. Mr. Whitehead also speaks of the “creativity” whereby the actual world has its character of temporal passage towards novelty.

IV

I have tried so far to keep within the concept of nature, and to summarise Mr. Whitehead’s own statements. It is a little difficult to do so since he so often goes beyond events and introduces his concept of “objects.” He says, for example, that the interfusion of events “is effected by” the aspects of those eternal objects, such as colours, sounds, scents, geometrical characters, which are required for nature “but are not emergent from it.” Here we come into touch with entities for thought which are not natural entities, and which are not, as such, subject to evolution, though through them certain natural entities are “realised” (or, as Mr. Whitehead sometimes says, “actualised”) for sense-awareness. Such objects are ingredients of events, or are “ingressive into the situations of events.” The situation is part of nature in the sense that the whole of nature extends over it. But the object is not part of nature, for nature is the total assemblage of events in passage towards novelty, and objects are elements which do not pass. Mr. Whitehead speaks of them as “elements in

nature," but, I take it, they are not yet in nature until they enter into situations through ingression. Having so entered, however, "the organism is a unit of emergent value, disclosing a real fusion of the characters of eternal objects, emerging for its own sake," but in internal relations to other organisms and to the all-inclusive universe of events.

Objects are of radically different types. For each type "situation" and "ingression" have their special meanings. Happily we need not think of them all, since the idea of situation has peculiar importance in regard to three types of objects; (1) sense-objects; (2) perceptual objects (subdivided into (*a*) physical objects and (*b*) delusive objects); (3) scientific objects. Atoms and molecules, for example, are distinctively scientific objects; a brick is a perceptual object; its colour or its "feel," a sense-object. Each in its special way is ingressive into that situation or cluster of events which we commonly speak of as the brick. These three types form an ascending hierarchy of which each member presupposes the type below. Objects of this, that or the other type are recognisable, but their "recognition" in no way alters the character of that which is recognised. It is noteworthy that this doctrine of objects is not restricted to so-called secondary qualities. It is not set forth as an alternative to the vicious bifurcation of nature, nor does it imply any psychic additions to nature. On this Mr. Whitehead is emphatic.

V

The argument in the *Concept of Nature* is that nature is what it is irrespective of any awareness thereof, or, as I prefer to say, any mental reference thereto. If we hold fast to this cardinal belief, we may leave to metaphysics the synthesis of the knower and the known. That implies that this synthetic relatedness opens up a problem for

metaphysics. And by metaphysics Mr. Whitehead tells us that he means the science that seeks to discover the general ideas which are indispensably relevant to the analysis of everything that happens. Something that happens is my awareness of, or perceptive reference to, yonder wall. We have, then, to consider the general ideas that are indispensably relevant to the analysis of this occasion. One of these, for Mr. Whitehead, is the ingression of objects into the situation. In this he firmly believes on metaphysical grounds. In any bifurcation of nature which entails psychic additions he disbelieves on logical grounds. He admits that it has been seriously entertained by respectable thinkers. He admits its "astounding efficiency" as a system of concepts for the organisation of scientific research. But this affords no justification for its acceptance. The pragmatist, he says, will swallow anything so long as it works. When all is said and done it is still "quite unbelievable." What *au fond* is for him unbelievable? I submit that it reduces to this: It is for him unbelievable that cognitive relations are other than irretrievably external.

Such cognitive relations there are. Among them is sense-awareness. The hyphen betokens this relation; so we have S-*a*. The crucial question then is: Does this hyphen betoken an external or an internal relation? In other words, is S.—the sensum—what it is in its cognitive relation to *a*; or is it what it is whether it be in cognitive relation to *a* or not? Mr. Whitehead, as I understand, believes that this relation is external; for, if it were internal, S. would be infected by psychic additions. He comes near to saying that this is so. The body, he tells us, pollutes the mind, the mind pollutes the body. Physical energy sublimates itself into zeal; conversely zeal stimulates the body. But there the context is action suffused

with feeling, and here and now the context is, broadly speaking, knowledge.

So long as Mr. Whitehead deals with nature as closed to mind he takes mind as spectator of that which is enacted on a space-time stage under the push and pull of "causal efficacy," or the relational go of events. But the theatre and the bodies of the spectators are on the physical stage. Only the minds of the spectators are off the stage. They dwell in a different world. Hence Mr. Whitehead, who weighs his words, speaks of the "alien" mind.

I suppose that one should try to think "homogeneously" in dealing with this alien mind—regarded as alien because its relation to all that is transacted on the physical stage is external only. But it is hard to do so. It is more difficult to discuss a concept of mind alienated from a concept of nature than to discuss a concept of nature alienated from a concept of mind. This difficulty Mr. Whitehead has to face. In his Barbour-Page lectures on *Symbolism* he presents his concept of mind as a companion picture to his concept of nature, developed in the earlier Turner lectures. If in both there is some heterogeneous thinking, this is perhaps inevitable in any attempt to discover the general ideas which are indispensably relevant to the analysis of everything that happens.

In *Symbolism* Mr. Whitehead is no longer chiefly concerned with the concept of nature as a closed system but with certain modes of activity of the human mind where activity is another name for self-production. The human mind, he says, is functioning symbolically when some components of its experience elicit "consciousness, beliefs, emotions, and usages," respecting other components of its experience. The former set of components are the symbols; the latter set constitute the meaning of the symbols. Symbolism from sense-presentation to physical bodies is the

most natural and widespread of all symbolic modes. This symbolism from our senses to the bodies symbolised is no doubt often mistaken. But that is true of all symbolism. Direct experience only is infallible. "I shall develop the thesis," Mr. Whitehead says, "that symbolism is an essential factor in the way we function as the result of our direct knowledge," and he proceeds on the assumption that sense-perception is mainly a characteristic of more advanced organisms, whereas all organisms have experience of causal efficacy whereby their functioning is conditioned by their environment.

One may here ask whether all organisms that have experience (which, he says, may be physical or mental) of causal efficacy includes atoms and molecules as organisms. I think that it does. For Mr. Whitehead is not one of those who use salient words on which an argument hinges now in one sense and now in another. Furthermore, later on, he speaks of "pure instinct" as the response of an organism to pure causal efficacy; and he adds: All physical response on the part of inorganic matter to its environment is thus properly to be termed instinct. This is noteworthy since it throws light on what he means by that causal efficacy, which he speaks of as "the hand of the settled past in the formation of the present."

In any case stress is laid on the experience of causal efficacy as primitive. The world given in sense-presentation is not the aboriginal experience of the lower organisms, later to be sophisticated by inference to causal efficacy. The contrary is the case. They may be inseparable, but first the causal side of experience is dominating, then the sense-presentation gains in subtlety.

Both fall under the general heading of Direct Recognition. This is the first type of cognitive functioning. It is, we are told, primarily the recognition of "objects" in-

gressive into the situation; but, as I understand, it is derivatively the recognition of their presence as ingredients in the situation. The second type of cognitive functioning is Symbolic Reference. Here we pass to the meaning that is symbolised. The nature of the relationship does not itself determine which is symbol and which is meaning. There are no components which are only symbols or only meanings. The more usual symbolic reference is from the less primitive component as symbol to the more primitive as meaning, for example from presentational immediacy to causal efficacy.

Leaving for awhile causal efficacy on one side, we find a group of words centering round presentational immediacy or immediate presentation. We have immediate experience which in one sense, he tells us, means "an ultimate physical fact." Then, in mental regard, we have sense-experience, direct experience, immediate acquaintance, direct recognition, direct perception, and direct knowledge. In view of what was said on the hierarchical order of "objects" one may, I think, select (1) immediate presentation in sense-experience; (2) direct perception; (3) direct knowledge (where "our mentality intervenes with its conceptual analysis"); as standing in hierarchical order, so that (3) presupposes (2) and (2) presupposes (1). If so, this accords with the stages of mental development which I have been led to distinguish as percipient, perceptive, and reflective. The point for emphasis is this: that, if we keep to the cognitive relation, the words "immediate" and "direct" imply that there are no psychic additions, for that would import vicious bifurcation into nature. In so far as immediate, that which, in current phrase, is "directly apprehended," is nowise altered under such apprehension. In other words the cognitive relation as such, is external. And this I make bold to say though Mr. Whitehead asserts

that, for the percipient at least, the perception is an internal relationship between itself and the things perceived. Does he not here mean the percipient event? In *Symbolism* "percipient" nearly always means mentally percipient and not only physically prehensive. And whereas in *Science and the Modern World*, Mr. Whitehead adopts a position of "provisional realism," in *Symbolism* he finds the foundation of a "thorough-going realism."

VI

Allow me here for a brief space to depart from Mr. Whitehead's text. In my own analysis of mental reference I distinguish three main levels—percipient, perceptive, and reflective. At the reflective level we accept a geometrical space-time scheme with effective relations—a construct of scientific thought for the interpretation of physical occurrences. At the perceptive level no such scheme is in being for the someone, say a two-year-old child, who perceives. None the less there is prospective reference and location in place—both suitably defined, but not as Mr. Whitehead physical defines "simple location." At the percipient level, under distinguishing analysis, there is neither prospective reference nor location in place. Space and time are not in the mental picture which is wholly lacking in perspective. There are all the so-called secondary qualities for which special modes of percipient reference have been evolved. There are as yet no primary qualities since, as spatio-temporal, they are emergent only at the higher level of perception. I have elsewhere (in *Mind at the Crossways*) stated the analytic grounds on which I base these conclusions.

My reason for introducing, parenthetically, the foregoing paragraph is that it bears on causal efficacy. I am myself increasingly shy of using either word since both are

ambiguous. If I substitute for it effective relatedness there will be those who say that this is a quibbling verbal distinction. Let me then state briefly what I mean. At the reflective level of scientific thought we seek to interpret events—let us say physical events. We are now-a-days bidden to do so in terms of a conceptual space-time scheme. But when we regard the event as an effect we need something more in the relational field than space-time only. Mr. Whitehead says that we need an element of “impetus.” I am content to speak of effectiveness.

But can we discuss causal efficacy or effective relatedness save at the reflective level? That is the point I raise. I hazard the opinion that at the age of two years Mr. Whitehead did not perceive causal efficacy though he did perceive much that he would now interpret in terms of this concept. And what he thus interprets is, I submit, not primarily the cognitive relation in presentational immediacy, or in direct perception, or even in direct knowledge, but what one may speak of as immediacy of awareness in behaving under percipience. That is no less primitive than is the percipience to which it is adjunct in all organisms which respond to stimulation.

On this understanding there is much in what Mr. Whitehead says on causal efficacy with which I am in cordial agreement. We both, I think, seek touch with something in common to nature and mind. And when he contends that it is a complete inversion of the evidence to say that presentational immediacy as perceptive is primitive and causal efficacy derivative, I hear an echo of Mr. S. Alexander’s contention (and mine) that *genetically* action is precedent to knowledge. But (I submit) our primitive mental touch with causal efficacy in action is not cognitive but in the wider sense conative. It does not lead

up to intellectual cognition but to concurrent human volition.

I want just now to keep close to the cognitive factor in the mind's conduct of affairs. Hence I resist the temptation to discuss Mr. Whitehead's doctrine—set forth in *Religion in the Making*—of "the aesthetic consistency of the world" however this may be brought about through ingression or otherwise. Here "aesthetic" connotes "feeling," and "feeling" is a synonym for "activity," while "activity" is "another name for self-production." Whence it follows that "an actual fact is a fact of aesthetic experience" (which need not be mental). As a plank in the platform of Mr. Whitehead's philosophy this is important. But it does not closely bear on the bifurcation of nature.

VII

More close in its bearing is the plural (worlds) in such a passage as "the various relationships within the real physical and spiritual worlds." We here come into touch with the relation between the percipient event in the context of one world and the mental percipient in the context of another world. We are told that "our most immediate environment is constituted by the various organs of our own bodies." It seems, then, that the percipient event is "environmental" to mental percipience. Such, in other words, is the relation of the physical occasion to the mental occasion.

There are two routes of "creative passage" from a physical occasion. One is towards "another physical occasion," and the other is towards "the derivative reflective occasion." The physical route links together physical occasions as successive temporal incidents in the life of the body. The other route "links this bodily life with a correlative mental life." A mental occasion is an ultimate

fact in the spiritual world, just as a physical occasion is an ultimate fact in the physical world. There is an essential reference from one world to the other. Here again two worlds; and, if I rightly understand, the linkage of physical occasions as temporal incidents in the life of the body, is radically different in character from that of a mental route with a correlative physical route. It exhibits, he says, "a new dimension of transition." Indeed this latter "linkage" may be negligible or absent. In the case of men and animals, there are obviously both routes in some way closely connected. In the case of a bit of inorganic matter any associate route of mentality seems to be negligible. On Mr. Whitehead's metaphysical theory, a belief in "purely spiritual beings" means that there are routes of mentality in respect to which associate material routes are negligible, or entirely absent.

We do find, however, that in men and animals the two routes in two worlds are closely associated and that there is something common to both. And that which the occasions have in common is, as I gather, derived by inheritance from the antecedent members of both routes. Here the word "inheritance" expresses what is elsewhere spoken of as "the conformation of state to state," the later to the earlier, from which, he says, temporal succession is a derivative abstraction, namely, the irreversible relationship of settled past to succeeding present. I take it that memory is an instance of such "inheritance" in so far as there is retention of the antecedent life-history of some dominant pattern; and that, in this sense, memory is common to mental and physical routes.

These mental and physical routes are in some way connected *within us*. It is *here* that their relation is discussed by Mr. Whitehead. And yet, till he comes to details, he protests against "the transformation of the grand question

of the relations between nature and mind into the petty form of the interaction between the human body and mind." I confess that, as one who seeks to be a faithful expositor, I am somewhat embrangled in difficulties. There are two worlds in some sense alienated—the physical and the spiritual worlds. But it seems from certain passages that it is hard to tell which is which. There is, in fact, we read, no proper line to be drawn between the physical and the mental constitution of experience. "It is a matter of pure convention as to which of our experiential activities we term mental and which physical." None the less, though they are only distinguishable under pure convention, there are two worlds, and in the one there are no psychic additions from the other.

VIII

Passing to another matter, I take it that the physical occasions which are in nature just pursue their creative routes, or, as Mr. Whitehead puts it, "blindly run." And I take it that the word "blindly" implies absence of cognitive foresight. But in human affairs there seems to be a good deal of running that is not blind but open-eyed. Here certain trains of events run subject to cognitive reference to an end in view. And in some way this cognitive reference does seem to make a profound difference in the way in which these physical events run their course in nature. But the closed system of nature brooks no psychic additions. As such it runs blindly. And yet the world of human affairs does not run blindly. In that world we have to reckon with mental guidance. Mr. Whitehead emphasises volitions without adding, as is elsewhere his wont: By volition I mean. . . . ; and without disengaging that cognitive factor in volition which an end in view unquestionably implies.

He says that we are faced by a dilemma. Either the physical molecules in the body run blindly or they do not. If they do, mental states are irrelevant; if they do not, mental states are relevant. He urges that the mental states *are* relevant, and that events in the body do *not* run blindly. We must not think in terms of materialism which applies only to very abstract entities the products of logical discernment; we must think in terms of organism. The "concrete enduring entities," he says, are organisms, so that the plan of the *whole* influences the very characters of the subordinate organisms which enter into it. In the case of an animal the mental states enter into the plan of the total organism and thus modify the plans of the successive organisms until the ultimate smallest organisms are reached. Thus an electron within a living body is different from an electron outside it by reason of the plan of the body. The electron runs blindly within or without the body; but it runs within the body in accordance with the plan of the body, and this plan includes the mental state. But, he adds, this principle of modification is perfectly general throughout nature and represents no property peculiar to living bodies.

I hold this to be sound doctrine. The principle of modification is that which is entailed by the unreserved acceptance of internal relations. It is the principle of modification through membership in a community. But the word "organism" is no longer used only within the closed system of "nature" as hitherto defined by Mr. Whitehead—that closed system the interpretation of which is the specialised task of the physicist. The organism now includes not only the modes of relationship emphasised in physical inquiry; it includes also mental relations which make a difference and are effective or betoken causal efficacy. But essential to the interpretation of a natural

organism—that is an organism which is part of nature as a whole—is internal relatedness; and it now seems that essential to the interpretation of a “concrete” organism is internal relatedness.

IX

So long as we keep strictly to a concept of nature, as Mr. Whitehead characterises nature, we are not called on, he says, to make any pronouncement as to the psychological relation of subjects to objects, in the traditional sense of these words. None the less he does announce that nature is closed to mind. The presence or absence of mental relations makes no difference to nature.

And so long as we keep strictly to this concept of nature the word “organism” carries a definite meaning. The organism is within nature. And if nature as a whole is closed to mind so also is an organism, as a part of nature, closed to mind.

But then we are told in due course that the “concrete organism” is not closed to mind. It includes the mental state. One would infer that “concrete nature”—if I may use this expression—of which the concrete organism is a part, is not closed to mind; and that a concept of nature which is closed to mind, is in that measure abstract.

Furthermore, it is in the context in which volition is under discussion that we are introduced to the concrete organism which is no longer closed to mind. And, since volition implies distinctively cognitive relations which make a difference in the running of physical trains of events, does it not follow that concrete nature includes cognitive relations? But Mr. Whitehead’s organic thesis is founded on the doctrine that all relations with which that thesis is concerned are internal. No less internal then must be the

relations we speak of as cognitive—for example those which are discussed under sense-perception.

And now for the bearing of this on the bifurcation of nature. If I am justified in so broadening Mr. Whitehead's distinction between the natural or physical organism and the concrete organism as to apply also to physical nature and concrete nature, then concrete nature (that is, nature "as a *whole*") includes all modes of mental relatedness. Concrete nature therefore includes that mode which is distinguishable as cognitive; and of this mode sense-awareness is an instance. How stands the matter on this basis?

Starting with his concept of nature as a closed system Mr. Whitehead finds among physicists a widely-accepted distinction between qualities called primary and qualities called secondary. He urges, as Berkeley had long ago urged, that there is no valid distinction. All qualities are, as he phrases it, "in the same boat." The two boats are respectively physical and mental. If some qualities are in one boat and some in the other, there is bifurcation of nature. But whereas Berkeley put all qualities, and nature itself, in the mental boat, Mr. Whitehead, in his *Concept of Nature*, put all qualities in the physical boat.

Within this physical nature-boat there is a community of organisms. We follow up, therefore, the story of organisms. Step by step we are led to the conclusion that the concrete organism includes the mental state. Does the "boat" analogy here break down? Not so, says Mr. Whitehead, if I rightly understand. But it requires some modification. There are still two boats; but he now calls them two worlds, the physical world-boat, and the mental world-boat. They are no doubt in relation. Still the relations *within* the physical world-boat are logically different from those *between* the two boats.

Believing as I do in one concrete nature, physical and mental, there is for me just one boat. On my own terms, but not I fear on his, I agree with Mr. Whitehead that there are no psychic "additions." But this for me is because mental relations, no less than physical relations, are already there. I admit neither bifurcation of qualities, nor bifurcation of worlds. All forms of two-boater I reject.

Professor Whitehead's *Process and Reality* had not been published when this article was written. He there says (p. 411): "The separations of perceptual fact from emotional fact; and of causal fact from emotional fact, and from perceptual fact; and of perceptual fact, emotional fact, and causal fact, from purposive fact; have constituted a complex of bifurcations, fatal to a satisfactory cosmology."

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THE ORDER OF NATURE

IN the first chapter of Whitehead's *Science and the Modern World* he cites the following passage from Hume: "In a word, then, every effect is a distinct event from its cause. It could not, therefore, be discovered in the cause and the first invention or conception of it, *a priori*, must be entirely arbitrary."

From this Whitehead argues (p. 6), "If the cause in itself discloses no information as to the effect, so that the first invention of it must be *entirely* arbitrary, it follows at once that science is impossible, except in the sense of establishing *entirely arbitrary* connections which are not warranted by anything intrinsic to the natures either of causes or effects. Some variant of Hume's philosophy has generally prevailed among men of science. But scientific faith has risen to the occasion, and has tacitly removed the philosophic mountain." He goes on to maintain that the antecedents of this faith, "which is impervious to the demand for a consistent rationality," are to be sought in an instinctive faith in the Order of Nature.

It would seem that both Hume and Whitehead have missed something here, something that may perhaps be revealed if we inquire further into the nature and origin of this instinctive faith which is the "animal faith" of Santayana. The biologist would make an analysis of the

situation which puts a different emphasis from that of the philosopher.

In the first place, the naturalist is inclined to doubt whether the contemporary philosopher has correctly interpreted the actual spirit of contemporary science in dealing with cause and effect sequences. "This strange contradiction in scientific thought" may prove to be a figment of the philosopher's imagination, not a scientific puzzle at all.

One of the chief tasks of natural science is the investigation of causal sequences. Unquestionably the effect is a distinct event from its cause, a novelty, and it may well be that the observer "in his first invention or conception of it" would be unable to discover the effect in the cause. The actual procedure is to build up the conception of the causal sequence *a posteriori*, that is, empirically, and in "his first conception" this relation may seem arbitrary to the observer. But further experience may show that behind every specific instance of a causal sequence there is not caprice, but order.

It does not follow that the connections thus empirically discovered are in themselves entirely arbitrary and "not warranted by anything intrinsic to the nature of causes or effects," as Whitehead assumes. In fact, we have good reason to believe that the contrary is true, not only by instinct but also by induction. The limited experience that we have of natural events is orderly as far as it goes, and this implies an order of nature underlying our experience.

Patrick in his stimulating book, *What Is the Mind?* follows Whitehead and says (p. 154) that evolution "cannot be defined as a series of orderly changes, for as far as the changes are evolutionary, they are disorderly." I maintain that the trend of evidence indicates that this is not true. Patrick himself seems to have doubts about it,

for he devotes his final chapter to a consideration of "Formative Forces," which, however, does not seem to the naturalist to rest on very substantial foundations.

The "jumpy" character of the emergents in the natural series—quanta to electrons, electrons to atoms, atoms to molecules, the inorganic to the vital, the unconscious to the conscious—and the new properties exhibited at each successive saltation impress us as disorderly only so long as we are ignorant of the exact details of the method by which the new and enlarged whole is fabricated from the simpler ingredients. These changes are not disorderly, or we could not discover laws of uniformity in the process and in some cases predict its course.

The various properties of the elements seemed disorderly until they were arranged according to their atomic numbers. Now their apparently erratic differences in atomic weight, valence and other properties are seen to arise in an orderly and intelligible way. They are none the less new properties for this. They were not latent or implicit in the electrons, needing only to be unfolded. They emerge or are created as novelties when the new atom of sodium or molecule of sodium chloride is fabricated. They inhere in the new whole thus built up, not in its discrete parts.

So mutations in organic evolution are novelties, but they are not disorderly in their appearance. They *seem* so to us until we learn the laws of their orderly appearance; and this we are slowly doing. For instance, it is now possible to induce mutations with a thousand-fold more frequency than they naturally occur by treating the germ cells with x-rays. Their emergence is not lawless.

The orthogenetic trend which so many naturalists see in evolution requires no mystical agency, nor are we lim-

ited to metaphysical speculation about it. Some of the physical factors actually operative can already be recognized, as I have elsewhere pointed out.¹

Now when a causal sequence is firmly established empirically one of its essential features is *contingency*. The effect does not follow unless the cause is present, and given the cause the effect always follows. This again is an empirical datum, not an *a priori* postulate, and it suggests that the sequence of events which is observed does follow as it does because the connections observed are intrinsic to the process in question.

There is no contradiction here in our sophisticated modern science between an instinctive faith in the Order of Nature and a consistent rationality. The contradiction came earlier and in a different context, as will be pointed out shortly.

Whitehead's illuminating survey of the rise of the new mentality out of medieval scholasticism needs to be supplemented at both ends—the precursors and the consummation of the enlightenment—in order to include the full picture.

First, glancing backward, let us inquire into the origins of that instinctive faith in the Order of Nature to which he appeals. His argument here is satisfying and might be paraphrased somewhat as follows.

It is the common experience of all animate things that the events of their environments exhibit certain uniformities and periodicities (day and night, summer and winter, and so on) to which they must adjust. These adjustments primitively are instinctive, that is, they are performed unthinkingly, irrationally. In this instinctive form they are common to all organisms; they are part of the fundamental

¹ "Irreversible Differentiation and Orthogenesis," *Science*, vol. 51, 1920, pp. 621-625.

action system. They arise because the Order of Nature itself is not "entirely arbitrary," but lawful; and the organism's instincts are also orderly or lawful (adaptive, the biologist would say) because the organism must adjust to the order of external nature or he perishes.

Now, Whitehead appears to leap at one bound from this elementary instinctive type of adjustment to the Order of Nature quite up to the close of the medieval period and the dawn of the renaissance. But during the progress of those tedious thousands of years while mankind was learning how to observe and to think many things happened which have some bearing upon our problem.

When primitive man began to rationalize his instinctive adjustments his nascent mentality was incapable of making wide generalizations. His thinking, like that of his brutish ancestors, was mainly in terms of concrete experiences. The formulation of an abstract Law of Nature was beyond his capacity. Moreover, the more obvious uniformities of nature upon which such a law must be based were already inwrought into the fabric of his instinctive behavior. He did not need to think about them.

It was the variables, the unexpected, the unpredictable, that presented the acute problems of adjustment. These were always in the foreground of his conscious experience, as Whitehead clearly brings out. Abstraction of those common features of experience upon which our scientific laws are based was impossible for him—and unnecessary, for his instincts took care of that. But upon adjustment to the novel features of his environment, to the unforeseen contingencies of his precarious existence, his very life depended.

So, when he began to think about his world, his ideas were formulated in terms of the concretes of his own ex-

perience, and particularly in terms of persons and their individualities. The personification of the unknowns, the unexplained, and the unpredictable naturally followed. So arose the primitive mythologies, which still abide with us.

A few rare geniuses were able to go farther and begin the process of abstraction and the formulation of natural laws, particularly the laws of thought as expressed in logic and mathematics. But, as Whitehead again reminds us, it was not until after the close of the medieval period that in popular thought law began to supplement magic and demonolatry.

The "strange contradiction in scientific thought" to which he refers—the contradiction between "arbitrary connections" in observed causal sequences and the Order of Nature—is nothing other than the rationalization of those primitive instincts that go back to our earliest biological ancestry and the replacement of crude animistic caprice by abstractions of wider reach, that is, the formulation of laws or uniformities abstracted from common experience by a rational process. This came late because the unreasoned instincts were adequate for primitive conditions and in later stages the traditional mythologies were adequate.

Not until these irrational mythologies were critically examined and (in some cases) found inadequate to meet the needs of an awakened interest in Nature and in Man as objects of direct experience were the mythological faiths questioned; and by that time the myths and the dialectic employed in reasoning about them were so deeply entrenched in scholastic and popular psychology that the awakening was a true mental and social revolution.

When an irrational taboo, a long-established social convention, or a sanctified religious dogma is thus critically evaluated in terms of recent innovations of scientific, social

or personal experience and is found lacking in rational sanction or in appropriateness to the changed conditions, then there is a real conflict, a struggle that stirs the personality and the community organization to their depths. The birthpangs of social regeneration come in rhythmic pulses, usually marked by the careers of some one or more dominant personalities—Moses, Christ, Galileo, Luther, Darwin, Lincoln, and the rest.

At the present moment we are obviously passing through such a period of storm and stress. The social fabric is trembling under the strain of conflict between hallowed social and religious codes of conduct and belief and a newly awakened critical spirit that insists upon asking, Why? If no satisfying answer can be given to that question, flaming youth will throw out the discarded tatters of outworn taboo and dogma without hesitation or compunction. They have already done it with some of the most venerable articles of the code of social conventions.

Our intuition, or "animal faith," is no more infallible than our mystical faith based on religious or metaphysical dogma. The present demand is for a faith—a real and effective faith—which has rational sanction, or at least is not contradicted by common and scientific experience. This is not an unreasonable demand.

In its modern form, then, the contradiction in scientific thought is not between arbitrary connections of cause and effect in logic or dialectic and the Order of Nature, but between arbitrary or capricious mythologies and the Order of Nature.

True, we cannot predict effects from causes in advance of experience. But, having observed a sufficient number of uniformities in a particular series of natural events, we

generalize these *ex post facto* and formulate the law. The Order of Nature as envisaged by modern science is, therefore, an induction of a very sophisticated sort, an induction that came only very recently in the history of human thinking.

This induction met great resistance, not because experience of nature was disorderly or arbitrary, for our experience of contingency always implies an order, not because instinct was opposed to experience, but because for more than two thousand years attention was directed to the variables, not the uniformities of experience and the rationalization was in terms of an uncritical mythology built up around these variables and unpredictables. These habits of scholastic rationalization in terms of dialectic rather than direct experience were very tenacious and with most of us they are still dominant despite upwards of three hundred years' experience with the scientific method and its quickening effects.

But as soon as the thinking public in general arrives at a stage of culture when abstractions can be grasped and used effectively as tools of adjustment, then law supplants magic and progress in the conquest of nature is accelerated.

When a sufficient number of these laws of uniformity are within our grasp we can begin to formulate laws of change, of growth, of evolution, and so on. We see that novelties are not lawless, but creative evolution is natural evolution. This marks another great step in advance; for now we can not only predict what will happen in the future if conditions do not change, but we can begin to see something of the trend of events in our own changing world and perhaps predict a revamping of the order of events which has not yet begun.

We can go beyond mere prediction, for we can take a hand in the control of the farther course of events ourselves. Knowing some laws of heredity, variation, mutation, and evolution, we can create new species of wheat or cattle or men by deliberate intent. We can foresee desirable ends and at times shape the march of events toward those ends. This puts in our hand the apparatus for the creation of a new civilization.

Though we cannot predict effects from causes of which we have meager experience, yet when our experience is sufficiently enlarged to enable us to set these causes in their orderly places in the flow of events as a whole, to see their inter-relationships, and to formulate laws of change, then we can see that what at first appeared to be an "entirely arbitrary" connection between cause and effect is in reality not arbitrary or lawless. For the causal sequence itself is naught but the expression of an underlying Order of Nature which is the most basic reality of our cosmos.

That Order to which we adjusted at first instinctively as one of the essential conditions of our existence now is envisaged intelligently. To our instinctive reactions we now add rational interpretation and control; and we go further. By observation and experiment we widen the reach of our experience and discover new secrets of nature and hitherto unsuspected features of the Natural Order.

This is the scientific method. There is nothing about it which is in contradiction to the Natural Order, for our modern concept of the Natural Order is the legitimate offspring of the scientific method.

Now a word further about these variables around which this argument is built up. Toward the close of his life Darwin said that the discovery of the laws of organic variability was one of the greatest desiderata of his time.

It still is, not only in biology but in cosmology. Change, the introduction of novelties in the Natural Order, creative evolution, these have given biologists and philosophers a world of trouble.

A change injected into the Order of Nature from the outside or a change arising as an isolated and unrelated event would be by definition unnatural and natural science would be quite helpless in the face of it. But we have no experience that requires belief in such arbitrary or capricious changes.

All unexpected happenings and all the novelties in our experience of which we have even approximately adequate knowledge are found to be knit into the Natural Order in law-abiding patterns. They have natural parents and natural progeny, and often we can trace the natural sequence of their generation. Everything that happens in our world of experience is in a sense a novelty. But it does not "happen" capriciously. It is caused; and the web of the flowing network of the causal sequence may reach out to the ultimate limits of our natural cosmos and there is no reason to assume that it goes beyond those limits.

One by one the "arbitrary" events of limited experience and crude thinking are taking their places in the Natural Order. The thunder bolts have been snatched from the hand of Jove and used to run the machinery of civilization. Even in the organic realm we can now see that Darwin's cry was both a hope and a prophesy. The prophesy has not yet come into complete fulfilment, but the hope burns with a clearer flame.

Perhaps of all the events in our experience the one that seems most arbitrary and lawless is a human volition. It has always been regarded as the typical caprice. Yet even here we can in favorable instances trace some of the

threads of a causal sequence. Is it better to assume that the parts of the pattern that we cannot see are lawless or supernatural and hence inaccessible, or to go on looking for the rest of them in the Natural Order? In so far as we can find them here, we can hope to be able to understand their mechanism and to improve and control it.

The problem of the nature of self-control—which with us is largely voluntary control—is the biggest problem of our time. Upon its correct solution depends our hope of the survival and further progress of human culture. If this problem lies within the Natural Order, we can hope to solve it and to apply our knowledge to personal and social betterment. If it does not—God help us! Nobody else can.

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PHILOSOPHY AND EMBRYOLOGY: PROLEGOMENA TO A QUANTITATIVE SCIENCE OF DEVELOPMENT (I)

I. *Physico-Chemical Embryology*

THE penetration of physico-chemical concepts into embryology is not likely to be entirely peaceful. "In experimental embryology," it has been said, "concepts borrowed from the physical sciences do not admit of calculations being made, and until they do they are not really playing the same rôle as they do in the sciences from which they have been borrowed and for which they were devised." "Nothing is more clear," says another writer, "in chemistry and physics than that identical results follow upon identical causes. Introduce a disturbing element, even a small one, into your experiment, and the experiment will fail. Such is not the case with the developing egg." W. McDougall, among many others, has also endowed the egg with good intentions. "The embryo," he says, "seems to be resolved to acquire a certain form and structure, and to be capable of overcoming very great obstacles placed in its path. The development of the forms of organisms seems to be utterly refractory to explanation by mechanical or physico-chemical principles." Finally, J. A. Thomson goes further than them all, and does not hesitate to say "It is a mere impious opinion that development will one day be described in terms of mechanics." Chapter four

of his Gifford Lectures illustrates the antagonistic attitude to physico-chemical embryology in its most acute form.

It can hardly be a coincidence that so many among the great embryologists of the past have also some claim to philosophical eminence, or at least were men of strongly philosophic minds. It would be absurd to support this opinion by citing Aristotle, but it holds no less obviously true of William Harvey, whose book on generation is full of thoughts about causation, and in the cases of K. E. von Baer, Ernst Haeckel, Wilhelm Roux, Hans Driesch, d'Arcy Thompson, and J. W. Jenkinson, there is no doubt about it. It is not really surprising, for of all the strange things in biology surely the most remarkable is the transmutation inside the developing egg, when in three weeks the white and the yolk give place to the animal with its tissues and organs, its batteries of enzymes and its delicately regulated endocrine system. This coming-to-be can hardly have failed to lead in the minds of those most intimately acquainted with it to thoughts of a metaphysical character. Nor, it seemed, did those who worked on it do much to diminish its wonder. "Neither the schools of physicians," as Harvey said, "nor Aristotle's discerning brain, have disclosed the manner how the Cock and its seed, doth mint and coine, the chicken out of the egg." Or, in the words of Erycius Puteanus, "I will neglect gold, and will praise what is more precious than any metal, I will despise feasts, and will set forth praises of something better than any food or drink. If you would know of what it is that I intend to speak, it is the egg; men marvel at the sun, at meteors flung from heaven, at stars swimming therein, but this is the greatest of all wonders." Here, however, there is one significant thing. It is that the very chapter of Harvey's book in which the preceding remark

is found has as its heading "The Efficient Cause of the Chicken, is hard to be found out." It certainly was, but the right clue was in the heading to that exercitation.

This peculiar association of embryology with philosophy, then, makes it necessary to defend from a theoretical angle the extension of the domain of physics and chemistry over embryology. No mention will be made of technical or detailed problems, as Bertalanffy, for instance, has done in his book on ontogenetic theory, for physico-chemical embryology hand in hand with its senior colleagues, experimental embryology and genetics, will easily be able to tackle them. This paper is written rather to remove the spiritual stumbling-blocks which encumber the first steps of the infant science. For the view that biology is, after all, only complicated physics is frequently questioned, and many biologists, having insufficiently considered the nature of the scientific method, think it likely that the discoveries of modern times may allow of some other basis for biology than an extended mathematical physics, and that the scientific method may rightly be in some obscure way different in biology from what it is in chemistry. If, then, the concepts of physics and chemistry are to be extended to a field of biology where they have never before received more than a conventional and formal reverence, the aim of its studies must be that expressed by T. H. Huxley when he said "Zoological Physiology is the doctrine of the functions or actions of animals. It regards animal bodies as machines impelled by certain forces and performing an amount of work which can be measured and expressed in terms of the ordinary forces of nature. The final object of physiology is to deduce the facts of morphology on the one hand and those of ecology on the other hand from the laws of the molecular forces of matter." It may be regarded as very noteworthy that Huxley here puts mor-

phology as secondary to physiology and as it were derivable from it; he does not place morphology and physiology on two high places, neither "afore or after other," as has so often been done, but he plainly states his view that the anatomical aspect of animals, their external and internal forms, could be deduced from the interplay of physico-chemical forces within them. The idea of the primacy of function seems always to have two meanings, firstly, the Epicurean-Lucretian one which Huxley uses here and Roux so brilliantly developed, in which shape is regarded as the outward and visible sign of the properties of matter itself, and secondly, the Aristotelian one emphasised by Lamarck's writings in the eighteenth century, and in our time by E. S. Russell's great work *Form and Function*, in which psychical factors are introduced as the essential elements in the ultimate analysis of shape. In both these interpretations, function has the priority over form, but the basis of function is the point of difference. Some thinkers still regard the predominance of the former, or physico-chemical, attitude, among working biologists with suspicion: J. H. Woodger is perhaps their most incisive spokesman. In their view, physiology and morphology are categorical, and the latter is emphatically not reducible to or derivable from the former. The two spheres of study represent, for them, correlative and immiscible disciplines, morphology aiming ultimately at solid geometry, physiology at causation. *Rerum cognoscere causas* would thus not be the basic desire of the scientific mind. Woodger objects to the view of "the ovum as a kind of chemical device wound up and ready to go off on receipt of a stimulus, the task of the causal morphologist being to disentangle the complex of events which constitute the unwinding process." He complains that in this physico-chemical view no account is taken of the past history of

the race which is left to genetics, again a causal discipline. To some extent these opinions spring from a conviction that the analytical method is inapplicable to a living being because it is an organism, and of that there is more to be said. But they also arise from a profound unwillingness to subsume biology under physics and a desire to uphold what is often called "the autonomy of biology."

2. *The Historical Perspective*

That the older embryologists awaited the extension of physico-chemical conceptions to embryology is no mere matter of conjecture. Until the mechanical theory of the universe had been consolidated by the "corpuscularian philosophy" of the seventeenth century, it would be useless to look for illustration of this, but by 1674 John Mayow was tracing the part played by the "nitro-ærial particles" in the development of the embryo, and in 1732 Hermann Boerhaave was discussing chemical problems with explicit reference to embryonic development. Then, when the second decade of the nineteenth century had nearly gone, von Baer, perhaps the greatest of all embryologists, was careful to preface his *Entwicklungsgeschichte* by a careful account of all that was known about the chemical constitution of the egg, and that although his philosophical inclinations were deeply vitalistic, and even his experimental interests morphological. In Roux, of course, this future reference came out explicitly, and the extension of biochemistry into embryology was allowed for the foreseen.

Embryology before Harvey, however, was rigidly Aristotelian, a statement the meaning of which Santayana has lucidly explained. "Aristotle," said he, "distinguished four principles in the understanding of Nature. The ignorant think that these are all equally forces producing

change, and the cooperative sources of all natural things. Thus, if a chicken is hatched, they say that the Efficient Cause is the warmth of the brooding hen, yet this heat would not have hatched a chicken out of a stone, so that a second condition, which they call the Material Cause, must be invoked as well, namely, the nature of an egg; the essence of eggness being precisely a capacity to be hatched when warmed gently—because, as they wisely observe, boiling would drive away all potentiality of hatching. Yet, as they further remark, gentle heat-in-general joined with the essence-of-eggness would produce only hatching-as-such and not the hatching of a chicken, so that a third influence, which they call the Final Cause, or the End-in-view, must operate as well, and this guiding influence is the divine idea of a perfect cock or a perfect hen presiding over the incubation and causing the mere eggness in the egg to assume the likeness of the animals from which it came. Nor, finally, do they find that these three influences are sufficient to produce here and now this particular chicken, but are compelled to add a fourth, a Formal Cause, namely, a particular yolk, a particular shell, and a particular farmyard, on which and in which the other three causes may work, and laboriously hatch an individual chicken, probably lame and ridiculous despite so many sponsors.” The Aristotelian account of causation could not be better expressed. Santayana puts this description of it into the mouth of Avicenna in his imaginary dialogue, and makes him go on to say “Thus these learned babblers would put nature together out of words, and would regard the four principles of interpretation as forces mutually supplementary combining to produce material things; as if perfection could be one of the sources of imperfection or as if the form which things happen to have could be one of the causes of their having it. Far differently do these

four principles clarify the world when discretion conceives them as four rays shed by the light of an observing spirit." In this last observation we may perhaps trace the germ of the Copernican revolution in philosophy effected by Kant, if we may take it to enclose the idea of the activity of the experiment subject in all perception.

In science generally, however, the Aristotelian conceptions went without serious contradiction, and thus formed the framework for all the embryological work that was done, as, for instance, by Albertus Magnus. Owing to its association with the idea of the plan of a divine being, the final cause tended in the middle ages to eclipse the others. In the seventeenth century this feeling is well shown in a remarkable passage, which occurs in the *Religio Medici* of Sir Thomas Browne: "There is but one first cause, and four second causes of all things; some are without Efficient, as God; others without Matter, as Angels; some without Form, as the first matter; but every Essence created or uncreated, hath its Final Cause, and some positive End both of its Essence and Operation; this is the cause I grope after in the works of Nature; on this hangs the providence of God; to raise so beauteous a structure as the World and the Creatures thereof, was but his Art; but their sundry and divided operations, with their predestinated ends, are from the Treasure of his wisdom. In the causes, nature, and affections of the Eclipses of the Sun and Moon there is most excellent speculation, but to profound farther, and to contemplate a reason why his providence hath so disposed and ordered their motions in that vast circle as to conjoyn and obscure each other, is a sweeter piece of Reason and a diviner point of Philosophy; therefore sometimes, and in some things, there appears to me as much Divinity in Galen his books *De Usu Partium*, as in Suarez *Metaphysicks*: Had Aristotle been as curious

in the enquiry of this cause as he was of the other, he had not left behind him an imperfect piece of Philosophy but an absolute tract of Divinity." This was written in Harvey's time, and in Harvey's thought the four causes were still supreme; his *De Generatione Animalium* is deeply concerned with the unravelling of the causes which must collaborate in producing the finished embryo. But the end of their domination was at hand, and the exsuccous Lord Chancellor, whose writings Harvey thought so little of, was making an attack on one of Aristotle's causes which was destined to be peculiarly successful. It would be superfluous to quote his immortal passages about the "impertinence" of final causes in science, for they cannot but be familiar to all scientific men. Bacon demonstrated that from a scientific point of view the final cause was a useless conception; recourse to it as an explanation of any phenomenon might be of value in metaphysics, but was pernicious in science, since it closed the way at once for further experiments. To say that embryonic development took the course it did because the process was drawn on by a *vis a fronte*, by the idea of the perfect adult animal or by intentions resident in the egg, might be an explanation of interest to the metaphysician, but since it led to no fresh experiments, it was nothing but a nuisance to the man of science. Later on, it became clear also that the final cause was impertinent in science owing to its inexpressibility in terms of measurable entities. From these blows the final cause never recovered. The seventeenth century was the time of transition in these affairs, and in such books as Joseph Glanville's *Plus Ultra* and *Scepsis Scientifica*, for instance, and Thomas Sprat's *Defence of the Royal Society*, the stormy conflict between the "new or experimental philosophy" and the Aristotelian "school-philosophy can be easily followed. Before long another of

the scholastic causes had to go. Bacon, indeed, had expressly excluded the formal cause from Physic, and it subsequently disappeared as thinkers realised that scientific laws depend on the repeatableness of phenomena, and that anything unique or individual stands outside the scope of science. Its final farewell was given it by Mill in his logic. Thus in the case of the developing egg, the formal (the particular farmyard, etc.) and the final causes are scientifically meaningless, and if it were desired to express modern scientific explanation in Aristotelian terminology, the material and efficient causes would alone be spoken of, essence-of-eggness being a "chymical matter" as well as the heat of the brooding hen.

The complexity of living substance, however, is such that many minds find it difficult to accept this physico-chemical account as the authentic scientific way of looking at it. This is doubtless due in part to an erroneous notion, which is yet very tenacious of existence, that the mechanical theory of the universe must, if accepted at all, be accepted as an ultimate ontological theory, and so involve its supporter in one of the classical varieties of metaphysical materialism. It cannot be too strongly asserted that this is not the case. To imagine that it is, is to take no account of the great space that separates us from the last century; how great has never been more clearly expressed than by William James. "When the first mathematical, logical, and natural uniformities," he said, "the first Laws, were discovered, men were so carried away by the clearness, beauty, and simplification that resulted that they believed themselves to have deciphered the eternal thoughts of the Almighty. His mind also thundered and reverberated in syllogisms. He also thought in conic sections, squares, and roots and ratios, and geometrized like Euclid. He made Kepler's laws for the planets to follow, he made ve-

locity increase proportionately to the time in falling bodies; he made the laws of the sines for light to obey when refracted; he established the classes, orders, families, and genera of plants and animals, and fixed the distances between them."

Far different is the account of itself which science has since learned to give, and though there are many variations of this account, the notion of natural law as conceptual shorthand is common to them all. But this change of attitude is not a revolt against thought as such, or against reason as such; it is only a loss of belief in the literal inspiration of the formulae proper to science. It would be just as extravagant to claim that the scientific investigator of the 20th century sets down absolute truths in his laboratory notebook, and, armed with an infallible method, explores the real structures of an objective world, as it would be fantastic to claim that Jehovah dictated an absolute code of the good to Moses on Mount Sinai. To say that the development of a living being can best be described in a mechanical way is not to say that it *is* mechanical and nothing else. The physico-chemical embryologist is not committed to any opinion on what his material really is, but he is committed to the opinion that the scientific method is one way of describing it, and that it is best to apply that method in its full rigour if it is to be applied at all. In other words, and following the train of thought of William James, he does not assert that the courts of Heaven as well as those of our laboratories resound with expressions such as "organisers of the second grade," and "so many milligrams per cent." The mechanical theory of the world, which is, as many believe, one of the ultimate types of human experience, can no longer be considered as necessarily involving the exclusion of other theories of

the world. Or, put in another way, it is a theory of the world, and not a pocket edition of the world itself.

But before bringing forward any arguments in support of this attitude and in defence of physico-chemical embryology, it will be well to consider briefly those theoretical tendencies in modern biology which go together under the loose and inexact adjective "neo-vitalistic," for their influence in scientific thought has been far-reaching. To deal critically with them is not a waste of time, for were we to adopt any one of them, we should find that the notion of embryology as complicated biophysics and biochemistry would have to be abandoned, and quite other means of approach (never, indeed very well defined) would have to come into operation.

A general survey of neo-vitalistic theories makes it possible to classify them under the heads of Hormism, Finalism, Dynamic teleology, Organicism, and Emergence. I shall bear in mind, in discussing them, the close practical connection which each of them has to the needs of modern embryological research, for they represent, as it were, the different ways in which it is possible to be an embryologist.

3. The Difficulty of Hormism

Hormism, or Psychobiology, may be dealt with in a few words. Chiefly supported by Wagner in Germany, and by E. S. Russell in England, it holds that a physiological tale—to use Lloyd Morgan's terminology—cannot be told separately from a psychological tale. Instead of expressing living processes in terms of physical causes and effects, the hormists wish to regard unconscious striving as the essential urge in life, and such conceptions as food, rest, fatigue, etc., as irreducible biological categories. These thinkers do not sufficiently acknowledge their debt to Galen of Pergamon who as early as 170 A. D., put forward an

essentially similar conception as the basis of his biology. In the treatise *On the Natural Faculties* he says, "The cause of an activity I term a faculty. . . . Thus we say that there exists in the veins a blood-making faculty, as also a digestive faculty in the stomach, a pulsatile faculty in the heart, and in each of the other parts a special faculty corresponding to the function or activity of that part." Galen also said, "We call it a faculty so long as we are ignorant of the cause which is operating," but he never suggested any such underlying cause, and seems to have thought it impossible to ascertain. So do the hormists of the present time. According to them the actions of protozoa are to be described in terms of avoiding responses, seeking responses and the like, language which, as they claim, is much simpler than the complex terminology of surface tension and molecular orientation. Everything, of course, depends on what you mean by simple. To say that a protozoon seeks the light is evidently more naive than to say that a bimolecular photochemical reaction takes place in its protoplasm leading to an increase of lactic acid or what not on the stimulated side, but since the latter explanation fits into the body of scientific fact known already, it is open to the biochemist to say that, for his part, he considers the latter explanation the simpler. It is, in fact, simpler in the long run. Psychobiology or Hormism differs from the other forms of neo-vitalism because it insists on retaining "commonsense" explanations in biology as categories of biological thought beneath which it is impossible to go. It dismisses the entelechy of dynamic teleology, on the ground that it acts, as it were, in addition to the mechanistic schema, accepting the latter fully but interfering in it. It resembles much more Finalism and Organicism, but lays stress rather on the unconscious striving force which seems to animate the carbohydrates,

fats, and proteins when they form colloidal solutions. It resembles the Behaviourism of Watson superficially by emphasising animal behaviour, but it fundamentally differs, for it asks the question—Does an animal see the green light and the red light in this experiment as we do, or does it see them as two shades of grey as colourblind people do? While the behaviourist asks—Does it respond according to difference of light-intensity or difference of wave-lengths? it recurs continually to psychical factors. Samuel Butler, for instance, one of its patristic writers, said, “I want to connect the actual manufacture of the things a chicken makes inside an egg with the desire and memory of the chicken so as to show that one and the same set of vibrations at once change the universal substratum into the particular phase of it required and awaken a consciousness of and a memory of and a desire towards this particular phase on the part of the molecules which are being vibrated into it.” “The Hormist contends,” says Lloyd Morgan, “that something which is very difficult to distinguish from a ‘plan-in-mind’ on the part of the embryo chick or rabbit does freely determine the course of events in specific growth from egg to adult. This, I urge, is a metaphysical hypothesis which goes beyond biology or psychology as branches of science.” Lloyd Morgan is right: after reading E. S. Russell’s “We need to look at living things as active, living, passionate beings like ourselves, and to seek in our morphology to interpret as far as may be their form in terms of their activity,” what is there to say except, *C’est magnifique, mais ce n’est pas la science?*

4. *The Stumbling-Block of Finalism*

Finalism and Dynamic teleology are closely connected, for both of them embody an attempt to go back to the Aristotelian inclusion of the final cause as an integral es-

sential of scientific method, and to regard the Baconian attitude to teleology as a mistake. They solve Kant's Antinomy of the teleological judgment simply by deleting the proposition, and leaving the counter-proposition. They are weakest on their practical side, for their supporters do not suggest any alterations which might be made in scientific method, although their fundamental assumptions plainly require it. The principal representative of Finalism is Eugenio Rignano, and Dynamic teleology has been for the most part upheld by Hans Driesch.

Rignano, in his *Qu'est-ce-que la Vie?* and his *Biological Memory* has contended that, though the mechanical concept of the universe may be perfectly satisfactory as a description of the world of physics, yet animals and plants show so much purposiveness that mechanical categories are absolutely inadequate for them. Biology, therefore, cannot be complicated physics and chemistry, but must be something *sui generis* and with its own methods and laws. "The long debate between vitalists and mechanists," he says, "in attempting to give an explanation of life, cannot lead to any conclusion unless that fundamental characteristic common to all vital phenomena of presenting a purposive, teleological, or finalistic aspect in their most typical manifestations is first thoroughly examined. . . . Even if the organism could be explained as a physico-chemical machine, there would still remain to be explained the most fundamental thing—how the machine constructed itself. The purposiveness of the ontogenetic development is too evident to be denied. It results from the convergence of manifold morphogenetic activities to one sole end, that is, to the formation of a marvellous functional unity, every part of which serves to maintain the life and guarantee the well-being of the whole. The embryo in its development manifests at every stage a 'harmony of composition'

as Driesch calls it, which has a touch of the marvellous; parts and elements of an organ develop independently, but when they have finished their development they are found to fit together perfectly like the parts of a machine and the one so answers to the other that they unitedly form one complex organ. Thus the mouth and intestine of the sea-urchin begin their development at two points distant from each other and develop independently, but as they grow the one moves towards the other, so that when development is ended they perfectly fit together and form a single canal." This passage illustrates the line of argument found throughout Rignano, and I will not remark on it further than to draw attention to the mention of the marvellous in it, another hint, if any were needed, of that strain of misplaced "numinous instinct" which seems to be present in all biological vitalists. *Omnia exeunt in mysterium* would seem to be a discouraging maxim for the scientific worker. "The direction of ontogenetic development," Rignano goes on to say, "toward a predetermined end is also influenced by the fact that the embryo overcomes early disturbances which might deflect it from its course. Ontogenesis thus seems marshalled by some occult intelligence or entelechy in the same way that the construction of a machine and the direction of its work is presided over by the mind of the engineer."

Now Rignano's arguments are open to grave objection on two main grounds, firstly, that he regards biology as suffering more than physics from the teleology of things, and secondly, that he wishes to bring the concept of purposiveness back into natural science.

The first of these is inadmissible on both philosophic and scientific grounds. Bernard Bosanquet best expresses the former attitude. He was led to his conclusions by the conviction that Ward and other opponents of scientific

naturalism had gone too far in their polemics against the mechanical theory of the universe, and had rested the case for teleology only "on the capacity of the finite consciousness for guidance and selection." This he considered a mistake. "Things are not teleological," he said, "because they are *de facto* purposed but necessary to be purposed because they are teleological." "The foundations of teleology in the universe are far too deeply laid to be accounted for by, still less restricted to, the intervention of finite consciousness. Everything goes to show that such consciousness should not be regarded as the source of teleology but as itself a manifestation falling within wider manifestations of the immanent individuality of the real." Bosanquet proceeds, "The contrast, then, of mechanism with teleology, is not to be treated as if elucidated at one blow by the antithesis of purposive consciousness and the reactions of part on part. It is rooted in the very nature of totality, which it regards from two complementary points of view, as an individual whole, and as constituted of interacting members." From a more scientific angle objection comes from Lawrence Henderson, whose book *The Fitness of the Environment*, probably the most important contribution to biological thought in this century, is never referred to by the writers of Rignano's school. It cannot now be necessary to recount how he examined the question of the finality of our present scientific knowledge, and, judging that it was considerable, went on to inquire into the properties of the elements and compounds principally associated with life. His conclusion was that living animals and plants exist in an environment just as fitted for them as they are for it, that the Darwinian concept of fitness, works, indeed, both ways, and that there is a reciprocity between organism and environment so that every teleological action performed by an individual organism

bears upon it the image and superscription of universal teleology. Thus the conclusion of the thought of Bosanquet and Henderson was that, though teleology is a metaphysical conception which it is impossible to do without, yet any limitation of it to or special association of it with, living organisms, is inadmissible. The question remained, and still remains, what has teleology to do with science?

This point has been approached best by J. W. Jenkinson with his usual clarity. "Those who uphold teleological doctrine," he said, "seem to have fallen into a confusion between two different things, the formal and the final cause. The material, efficient, and formal causes, if we mean by the last the idea of the effect in the mind of a sentient being, all precede in time the occurrence of the effect; and this kind of teleology is not, as it is asserted to be, a doctrine of final, but one of formal causes. The final cause stands for the use to which an object is to be put, the effect it will produce, the function it will perform, which obviously succeed in time the existence of the object itself. The final cause, then, cannot be taken as ever determining in time the existence of the object itself, and is therefore a conception which belongs not to science but to metaphysics. The only necessary conditions of a phenomenon ascertainable by science are those material and efficient causes which precede it." Or, as Streeter puts it, "If there is purpose in nature, we ought not to expect science to reveal it. Purpose is activity the direction of which is determined by an end, that is, by an apprehension of quality or value. But quality cannot be measured, and therefore from its essential nature it—and along with it purpose—lies outside the sphere of science." Or, finally, to go straight to the fountain-head, "If I say," wrote Kant, "that I must judge according to merely mechanical laws, of the possibility of all events in material nature and consequently of all forms

regarded as its products, I do not therefore say: they are possible in this way alone. All that is implied is: I must always reflect on them according to the principle of the mere mechanism of nature and consequently investigate this as far as I can; because unless this lies at the basis of investigation there can be no proper knowledge of nature at all." Purposiveness, in fact, is not a conception which interlocks with quantitative treatment; that mathematical expression of relationships which is the ideal type of all science has here nothing upon which to impinge, and the pulling force, perpetually going on before, eludes and must always elude, if this analysis is correct, the advancing web of mechanical explanation.

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(to be continued)

DETERMINISM AND MODERN PHYSICS

THE history of modern thought is in its main features the history of natural science. In that Aristophanic chorus of many voices it takes no very keen ear to detect the dominance of those to which science has given the key-note; and even the dissonant strains are determined by that against which they rebel. Either as pro-scientific or anti-scientific Western philosophy has revolved about the ever increasing mass of natural knowledge. Art, religion, poetry, as well as pure philosophy, in so far as they possess vitality today, derive their significance from science; they either accept or protest against a world of thought and action which is the creation of the scientific spirit. Like Emerson's Brahma, science can say:

They reckon ill who leave me out:

When me they fly, I am the wings.

On the face of things, the contest is merely the modern version of an ancient feud—between the lovers of concrete fulness and the abstractionists, the Goethes and Newtons, or, as William James so neatly puts it, between the “thick” and “thin” philosophies. But though this is true in a measure, the dichotomy is not so simple. That which complicates it, and at the same time exacerbates the conflict, is the success of science, particularly of the science of physics. This has worked in two ways.

First, by enlarging man's power over matter, it has made possible new modes of life, and these activities have reacted on our ways of thinking. In this practical sphere it is not a matter of rival philosophies; we have rather a discord between the round of our daily life and our traditional creeds. The history of the so-called "warfare" between science and religion is but a chronicle of street riots, sporadic affrays between the native inhabitants and newcomers who were in possession of the country before their presence had been noted. The Fundamentalist never made a serious fight over the operations of the Weather Bureau; he consults his doctor when sick; he takes his car to a mechanic for repairs. He turned frantically on Darwin—two generations ago in England, and again recently in America—as if the publication of the *Origin of Species* had constituted the first attack on his faith. The vehemence of this protest was itself symptomatic of the inner discord; the whole Fundamentalist movement might be described, in the jargon of the psycho-analysts, as the expression of an inferiority complex by organized religion. For, long before Darwin, the western world had built up a civilization and a mode of daily life in which a definitely anticipated future took the place of complete uncertainty as to the behavior of an arbitrary despot. That mode of thought which flourished in the intellectual climate of the middle ages has a hard struggle to survive in this day of machines and popular government. The transition from an age in which little seemed knowable, but everything important known, to one offering endless possibility but no finality of knowledge, has required much hardihood of those who faced it consciously. It is small wonder that the common man, like the sailor in the crew of Columbus, is seized with sudden panic on realizing the voyage on which he has embarked.

But there is a second way in which the success of science has reacted more directly on philosophy. Considered simply as a body of abstract knowledge, the science of physics towers above all other creations of the modern mind. With the work of Newton and his followers began a new era of speculative thought, and the revolution thus inaugurated has run its course independently for the most part of the increase of mechanical inventions and of the industrial expansion which was its later fruit. Without minimizing the importance of the Copernican theory in the history of philosophy, I think it may be claimed that the effect of the *Principia* has been more profound. The adjustments demanded by the former concerned mainly the cruder parts of theology,—the location of heaven and hell, the naive anthropomorphism of the Old Testament and the literal acceptance of its cosmology. These adjustments could be made without impairing any essential attribute of the divine power; indeed they might be considered as enhancing it. With the appearance of the *Principia*, on the other hand, the conception of unchanging natural law, of inexorable order, passed from the almost exclusive possession of a small group of scientific workers and became the common property of thinking men. The science of mechanics was brought very quickly to practical perfection, and this most perfect part of the edifice of science became the pattern toward which all the other builders strove. Not only were the laws of mechanics of great simplicity and elegance, but in the motion of the planets they were exemplified on so grand a scale, both of space and time, that the imagination of men took fire. We all know what vistas opened out to the eyes of eighteenth century rationalism; how its enthusiasts looked forward to a world which under the dominion of mathematics would be foreseeable

in all its details. The intoxication of that first triumph has now long subsided, but the concept of law has remained, and today we are able to appraise more exactly the extent of the wreckage it has wrought among the older beliefs.

The devastation has been wholesale. The appalling vastness of the Copernican universe could have been borne with some equanimity; the oppressive order of the Newtonian has swept all before it. God himself has been all but dethroned; from his position of absolute ruler and active participator in the daily lives of men he has been reduced to the status of a constitutional monarch, a figure-head allowed to reign only on condition that he does not interfere. That which happens is the only thing that could have happened; our finite eyes may read the book prepared for them, but that book is already complete from title-page to colophon. Calvinistic theology may save the dignity of God by considering natural laws as his self-imposed limitations, but the old intimate relation between man and his Creator—that relation which in the middle ages flowered so gloriously in the great cathedrals—has vanished from the vision of those who have tried in all honesty of soul to see God through nature. The spirit of man is today enmeshed in a web of fine-spun deterministic logic, and each advance of science seems to add another strand for our imprisonment.

This, determinism, is the bitter poison in the cup of knowledge, paralyzing man's efforts, changing to gray the green and gold of life, its music to mocking laughter. It was in the nineteenth century that the revolt against the determinism of science took shape. The violence of the attack on Darwin was the expression not merely of a resentment of the moment, but of a long accumulation of in-

juries. The *Origin of Species* gave the excuse for an outburst long overdue. Whatever we may think of Tennyson as a poet, we must set it down to the credit of his intelligence that in *In Memoriam* he saw the real issue,—not the simian ancestry of man but the blind mechanism of the cosmic process. But we find a better, though subtler, expression of the revolt in Edward Fitzgerald. Instead of the *Credo quia impossibile* of *In Memoriam* we have, in his rendering of the Rubaiyat, an outward acceptance of the new philosophy,—“The Ball no question makes of Ayes and Noes”; but it is the acceptance of an insult which one is powerless to avenge.

A Moment's Halt—a momentary taste
Of *Being* from the Well amid the Waste
And Lo!—the phantom Caravan has reach'd
The *Nothing* it set out from—Oh, make haste!

Into those last three words are breathed his utter scorn for “this sorry scheme of things,”—a scorn which found its last expression in his defiant epitaph: “It is He that hath made us and not we ourselves.” All that is left to man is sardonic laughter and the creation of beauty. In Thomas Hardy we find a similar note. His characters are the characters of Greek tragedy, puppets of circumstance to whom the artist accords the pity that the cosmos withholds. It is not that, like Tennyson, these writers were consciously reacting to a formulated philosophy; rather they struggled for breath in the atmosphere into which they were born.

But besides the revolt expressed by art and literature, there has been a philosophic reaction. As representative of this dissident attitude we may take the philosophies of James and Bergson. It is no accident that the strongest protest should come from these “thick” philosophers; it is their sense of the unexpressed, of the left-out in the scien-

tific scheme that provokes it. If, with the absolutists, we are content to whittle concrete reality down to an abstraction, one abstraction is as good as another; such a mind can find complete satisfaction in the proposition that determinism is the fullest freedom, or some equally fatuous paradox. For William James it is the fullness of life to which science denies expression, and which must have its due.

"If a certain formula for expressing the nature of the world violates my moral demand, I shall feel as free to throw it overboard, or at least to doubt it, as if it disappointed my demand for uniformity of sequence."

James insists on the validity of the subjective testimony, as against retrospective wisdom or objective observation.

"... decisions, for him who makes them, are altogether peculiar psychic facts. Self-luminous and self-justifying at the living moment at which they occur, they appeal to no outside moment to put its stamp upon them or make them continuous with the rest of nature. Themselves it is rather who seem to make nature continuous; and in their strange and intense function of granting consent to one possibility and withholding it from another, to transform an equivocal and double future into an inalterable and simple past."

Bergson, like James, finds in subjective experience the warrant for his beliefs, but his solution is at once more radical and more critical. The scientific account of things is not merely too partial; it is impotent to grasp reality. Not only science, but logic is without power to lay hold of the reality of things-becoming; their kingdom is the dead, static past. With rare critical insight he singles out the reason for this limitation. Logic is *spatial thinking*; it is concerned with separations, overlappings, inclusions; with the relations of parts and wholes, all of which can be symbolized and represented as relations of exten-

sion. On the living tissue of experience, on motion, on transition it can lay no hold; for these things-becoming it ever substitutes the dead shell of the thing-become. Time, as time passing, is the creative process itself. Only when the trickling moment is congealed in the stillness of the past can it be scrutinized, dissected, compared. Time, to be thought about logically, must become space,—that is, past time.

All of which is all very well for those who can find solace for their *Weltschmerz* in a rejection, partial or complete, of the scientific presupposition. The stumbling block in the way of their acceptance is the success of science. Both James and Bergson rest their argument on the supposed limitations of the scientific approach to reality. Their reasoning, if accepted, leaves us free to believe in indeterminism, but that is all. They produce no new magic formula capable of victories of its own to match the conquering onrush of science. Both writers admit, in effect, that science as such rests on determinism. To the practical, pragmatic mind they thus concede everything. Abstract reasoning can make little headway against the logic of success, the argument of "method and results." If determinism is a necessity of thought for the physicist, it is bound to invade biology and psychology, however valiantly the rearguard of the vitalists and introspectionists may dispute the advance. For the success of determinism as a working hypothesis is undoubted. The whole history of biology is a chronicle of its victories and of the shifts of the vitalists in their endeavors to find some corner not accessible to the chemist and physicist, some phenomena distinctively vital. The behaviorists have started a similar assault in psychology, denying the existence of the distinctively psychic and asserting that the objective traits of human behavior—that is, the material reactions of

the organism—are alone knowable and that their description exhausts reality.

With determinism as a working hypothesis there can be no quarrel. The physicist may be interested only in those aspects of nature which fall within its scope; the biologist may limit his study to phenomena expressible in the mechanistic formula; the behaviorist may assert "consciousness" to be none of his business. But, unless some rival hypothesis can be shown to be equally effective, it is against all reason to imagine that it will retain this provisional character. The meaning of the word will shift from epistemology to ontology, hypothesis will become dogma, and the meaning of the universe will pass from a pragmatic "as if" to a categorical "nothing but." We cannot meet this advance by pointing to the lack of proof. It is idle to talk of limits to scientific inquiry, for science has again and again broken through such barriers and there can be no assurance that the new ones will hold. Nor will a mere license to doubt determinism avail much, if all that is positive and triumphant in human thought is bound up with belief.

But what if there should be an alternative hypothesis, powerful in its own right to order experience and interpret nature? What if the concept of indeterminism, void of positive content as it might at first seem, could be shown to be able to dominate autonomously a realm of its own and even perhaps to invade the kingdom of its enemy? In that case the situation is completely changed. Determinism can never progress beyond the stage of an hypothesis,—entitled, indeed, to a full acknowledgment of its pragmatic value but to no pretensions of dogmatic sanctity. But can this be done?

It has been done already. A large and growing body of modern physical theory rests, in effect, on a postulate

of indeterminism in events. Only an ignorance of science and a slavish worship of dialectic has prevented the recognition of this fact by philosophers. Science is, in fact, one thing; and the philosophy of science quite another. Science stands to philosophy in the relation which literature bears to criticism, art to aesthetics;—the one active, self-justifying, unconscious; the other withdrawn, hesitant, introspective. Just as the living tissue of creative writing has a way of breaking through all set forms, disregarding all canons of criticism and making a new tradition, the growing body of science has found little nourishment in the "methods" it has been supposed to follow. Since the time when Bacon erected the preposterous fabric of his *Organon* to the present, the creative element in science has eluded the grasp of criticism. It was Bacon's contemporary, Harvey, I believe, who said that Bacon's ideas of science were "such as might be expected of a Lord Chancellor." John Stuart Mill's *Canons of Induction* have waited till quite recently for a similar devastating criticism by Norman Campbell:

"If the discovery of laws could be reduced to a set of formal rules, anyone who learnt the rules could discover laws. But there is no broad road to progress. Herein lies the most serious objection to much that has been written on the methods of science. There is no method, and it is because there is no method which can be expounded to all the world that science is a delight to those who possess the instincts which make methods unnecessary."

This is not to deny to philosophy an important function; it is to emphasize its true function. This consists not in teaching the fish to swim and the bird to fly, not in laying down rules for the scientist to follow under penalties of excommunication; but in extracting from a certain phase of creative activity its universal significance. Not the meaning of science for the scientist, but its meaning

for art, for religion, for life itself is the philosopher's concern. In furtherance of this object it is incumbent on the philosopher to see science as it is, not to force it into an arbitrary mould. It is precisely here, I think, that he has failed. The philosopher has chosen to see in mechanics the perfect type of science, of which all other modes were but incomplete realizations. By so doing he has been able to erect neat, self-contained systems; the stuffed animal has proved much more manageable than a live one. With apparently complete self-satisfaction he has ruled out as "unscientific" or as "illogical" anything that would not fit the scheme. Thus, while the philosopher has gone one way, the scientist has gone another, refusing to accept responsibility for dialectic tangles, content with his pragmatism and meeting Eleatic dilemmas with a "*solvitur ambulando*."

The body of physical theory to which I refer and which I claim involves the abandonment of the deterministic postulate is the theory of so-called "irreversible" phenomena. The laws of these rest, according to our present view, on a *statistical* basis; their formulation and interpretation is in terms of the theory of probability, and this in turn is irreconcilable with determinism. In the following argument I shall avoid as far as possible the technicalities of physics, limiting my illustrations to matters of every-day knowledge. Though the exposition is at best a difficult matter, I have some hope of setting its main features in a clear light, leaving for later treatment some of the implications of the main thesis.

The philosophical essence of the science of mechanics is to be found in the concept of time which it uses. The planet swings round the sun; yesterday it was there, today it is here, tomorrow it will be yonder; but this yesterday, today and tomorrow are but illusions imposed by the finite-

ness of our senses. Where the planet was and where it will be are both accessible to the mind. That which has happened still is, and that which will happen must be and thus in a sense exists already. Effective causation is an illusion; the present is no more determined by the past than by the future; the past, the present and the future are bound together in a single coherent whole which, to the eternal mind, simply *is*.

For it is characteristic of the laws of mechanics that the recovery of the past and the prediction of the future are on exactly the same footing. If nothing but the direction of motion were changed, the future history of this new mechanical universe would recapitulate the past history of the old. The phenomena are, as we say, *reversible*. Past and future have for mechanics no more absolute significance than right and left, forward and back. So long as we deal with these reversible coherences we may apply the ideas of Einstein, convert time into another dimension of space and plot every event in a four-dimensional eternity. It is to Bergson that we owe the clear perception of this spatial character of mechanical time. He was, however, imperfectly familiar with the science of his day and hence assumed spatial time to be "the" time of all scientific thinking. The result has been a quite unnecessary opposition of his views to scientific modes of thought, an opposition which leaves him, like Berkeley, with the problem of accounting for the possibility of objective knowledge. It will be seen in what follows that actual scientific thought is in much closer accord with Bergsonian ideas than he imagined.

For even if we ignore the testimony to which Bergson makes appeal, namely, the facts of our subjective life and those of organic nature, we cannot thus reduce the empirically given universe to a timeless geometric manifold.

Whatever the ideal world of dynamics may be like, the actual inanimate world is one in which *things happen*, in which past and future are absolute, not relative categories. Thunder follows lightning. If we place a kettle of water on the stove, the water gets hotter, not colder. Quite apart from the forms of life, the earth itself has changed in a way not comparable to its motion in its orbit; the change is not part of a cycle. Certain processes of nature are, as we say, *irreversible*. I use the word as the physicist uses it, without metaphysical commitment or connotation, simply to describe the empirically given fact. It may be that the world is so constructed that even here the distinction between past and future is one to which nothing in rational thought corresponds, that there is no reason *a priori* why an observer should find the course of events going in one direction rather than another. The earth moves in an orbit which, seen from the north, is described counterclockwise, but no one imagines that this direction is to be preferred over the reverse as having profounder roots in the very order of being. If we leave out of the argument, as I do here, the fact that the universe is experienced or thought about by human minds, it might be claimed that the "time" in all physical processes could and possibly does "run backward" somewhere else. Those who hold to the mechanical concepts are bound, it seems to me, to admit the possibility of such a universe as conceivable on equal terms with the one we know, but I shall not press the point. The physicist at least has accepted the fact of such irreversible processes as a part of his experience, and has sought not only to formulate empirical laws but to obtain some insight into their nature.

This insight was furnished by Clerk Maxwell through his work on the kinetic theory of gases. The atomic theory, of ancient origin, had been applied by Dalton to

explain the facts of chemistry, but until Maxwell's time it had little importance as a physical hypothesis. With the kinetic theory of gases was inaugurated a new method of physical inquiry,—the statistical method. Since then its scope has been vastly extended, but it has not received from philosophers the attention that it deserves. It cuts more deeply into our ideas about nature than is generally recognized and, as I hope to show, leads to a cosmology radically different from that based on Newtonian ideas.

To make this clearer it will be well to have one or two illustrations of irreversible processes so that the argument can be pointed with concrete examples. Suppose I put into a glass some red ink and some blue ink. If I pour carefully I can have one color at the bottom of the glass and another at the top with a fairly sharp line of separation. This condition will not be permanent. Left to themselves, the colors will gradually mix by diffusion. Anything that we can do in the way of stirring or agitation will only hasten this process of mixing; we cannot alter the direction of the process. A second simple illustration is that of a hot body A and a cold body B placed in contact. What happens we describe as a flow of heat from A to B which continues until both bodies are at the same temperature.

The description of these two processes in terms of the atomic theory is on its face very simple. We consider the molecules, either of the liquids or of the hot and cold bodies, as colliding at random, and thus foresee the final result as the statistical outcome of an enormous number of individual collisions. We say that the mixed state of the inks, or the equal temperature of the two bodies, is "more probable" than the unmixed state or the unequal temperatures,—so much more probable that its eventual

attainment is a matter of practical certainty. The processes are seen as exactly like those involved in shuffling a pack of cards. If we take a new pack fresh from the maker, the cards are arranged in a certain "regular" order. As we shuffle, this order is replaced by other arrangements which we call "irregular." We say that the irregular arrangement is more probable than the regular, but this does not mean that any one arrangement is more probable than any other. It is the *kind* of arrangement that is more probable. Of all the possible ways that we may arrange a pack (the number of which, though large, is finite) a very small proportion are singled out as regular, while the overwhelming majority are lumped together as irregular. The greater probability of the irregular is for the same reason that white sheep eat more than black—there are more of them. In the same way, of all the equally probable distributions of the ink molecules in the glass, all but a very small fraction constitute what we call mixtures; of all the equally probable interchanges of energy between the fast-moving molecules of the hot body and the slower-moving molecules of the cold body, an overwhelming proportion involves a loss of energy by the fast molecules and a gain by the slow molecules. All our calculations of probability are made in this way. We analyse the possibilities into equally probable instances, and find the probability of some one characteristic or quality of the event by calculating what proportion of all these possibilities possesses the assigned character. If we grant an understanding of the meaning of equal probability, the rest of the physicist's argument presents no special logical difficulties. But what do we mean when we say that two events are equally probable? What, indeed, do we mean when we talk of probability at all?

From the determinist point of view the word means

nothing except as a name to cloak our ignorance. The die or the coin falls in the manner preordained for it; where necessity reigns there can be no talk of real possibilities in the future, or of real probabilities. To speak thus is to say that the future holds genuine alternatives; it is to negate the principle of causation. There is no need to recapitulate at length all the old arguments. For this contention is really an admission of what I should have been at some pains to prove; namely, that the idea of probability is inconsistent with the idea of necessity. We may even go further and admit that the deterministic standpoint is the only one consistent with the processes of formal logic; that the concept of probability eludes all attempts to formulate it logically and leads us into a maze of paradox. For instance, suppose we say that in the fall of a coin heads and tails are equally probable. When challenged to define our terms we make a poor showing. We may say that in a large number of throws the percentages of heads and tails will be equal, or we may appeal to the accumulated results of past trials. But neither of these statements covers the content of the original assertion. For our prediction of the future cannot be absolute but must itself be stated as a probability, while our inference from the past is likewise only probable. We are thus forced to define one probability in terms of another and our logic comes full-circle upon itself. No logical way out of the difficulty has been found or seems likely to be found. Whoever wishes a fuller presentation of the difficulty should read the chapter on probability in Poincaré's *Science and Hypothesis*.

But though determinism and logic agree as to the proper way to deal with the question, this way is altogether too summary. Decapitation is indeed a sovereign remedy for most diseases, but it has always been unpopular. In

spite of logic, the assertion that heads and tails are equally probable is much more than a confession of ignorance,—its significance is positive. And though we may deduce from the assertion other affirmations about the statistics of repeated trials, the primary meaning relates to one event; we affirm this event to possess a certain quality or characteristic. We know practically the meaning which we cannot express. The assertion of probability determines a certain practical attitude toward the future. Devoid of logical foundation as the theory of probability undoubtedly is, it is able to meet this pragmatic test of rationality; it helps us to organize our experience and heightens our sense of understanding of the empirical data. I know that to many pragmatism is epistemological anarchy; and many more will be appalled at the thought of dispensing with logic. But the situation is none of my making. I am describing the way in which a good deal of scientific thinking is carried on today and, logical or not, this thinking seems to those concerned with the increase of positive knowledge to be important.

But though we cannot resolve the paradox, I think that Bergson has given us more than a hint as to the real nature of the difficulty. May not this lie in the fact that all logical thought is *spatial*, that its scope is limited to those relationships, such as the whole-and-part relation, which can be symbolized by extension? For space, with its added dimension of time past, is the universe of things-become. Probability is our mode of laying hold on the not-yet-become, on time as opposed to space. It is not so much illogical as non-logical. It opens to the mind a domain to which spatial thought cannot penetrate. I hope to show presently that it leads to conclusions of a different order from those attainable by canonical logic. But first I must make one point clear.

This is that the very concept of probability denies determinism. "May" and "must" are irreconcilable. When I say that the chances are equal of the coin coming up heads or tails, I assume that the event is not yet a part of nature. The course of nature in the matter of penny-pitching behaves *as if* the result were not merely unknown, but unknowable; *as if* the result of each toss were unrelated to previous events. The assumption may be wrong but it is superfluous nonsense to say that indeterminism is inconceivable. That which is apparently true is certainly conceivable. Another illustration will help to show more clearly that the concept of probability involves the idea of unrelatedness. Suppose I calculate the probability of a given hand of cards. From the result of this calculation I make a prediction about the statistics of such hands. This prediction is an affirmation as to the course of certain natural events, and can hence be tested by experiment. But to make this test valid, it is necessary to shuffle the pack thoroughly between each deal, thus deliberately breaking the links which bind one hand to the next. It is no answer to this for the determinist to say that the links cannot really be broken; that if we knew all the steps the outcome of each deal would be a matter of certain foreknowledge. For the question here is not what we might know, but *why we shuffle*, and to this question the determinist can give no answer. If the whole question is one of ignorance or knowledge, why do we endeavor by shuffling to increase our ignorance?

But not only does the concept of probability deny determinism; it leads to a prediction which is not accessible to the determinist. Return to the simpler example of the coin. Let us allow the determinist his knowledge of causes. Thus armed, he calculates for us the result of a hundred throws. He predicts for us a certain succession

of heads and tails and the relative percentages of these are necessarily included in his forecast. But they will be the percentages for that particular problem; the statistical prediction as such will elude his mathematics. He will only be able to assert that it "just happened" that way, because his causal data "just happened" to be that kind of data. While his figures may tell him that there will be, say, forty-five heads and fifty-five tails, this fact has for his point of view no significance. The indeterminist, on the other hand, goes straight to the statistical prediction with the aid of his assumption. Though he never reaches absolute certainty of the future, he speaks with more assurance of the result of a million throws than of a hundred. The more hopelessly insoluble the problem considered as one of causes, the more certain the prediction based on the assumption that there are no causes. If the concept of probability is merely a cloak for our ignorance of causes, in what strange manner does increase of ignorance bring certainty of knowledge?

Please bear in mind that I am not attempting a refutation of determinism. On the contrary, I believe that in the very nature of things this is impossible, for it would require us to show that things *could have* happened otherwise than as they did, and nothing in nature is really repeated. All that I have attempted is to deprive the doctrine of that philosophical sanctity which attaches to a supposed necessity of thought; to show that the doctrine of indeterminism plays an important part in actual scientific thought, and that it shares with determinism such pragmatic prestige as attaches to the success of science. But while a physicist could supply the scientific corollaries to my talk of cards and penny-pitching, the general reader will be left somewhat in the dark as to the scope and scien-

tific importance of the statistical method. This omission I must now make good so far as space will permit.

At the present writing the science of physics is in a state of transition and therefore of comparative confusion, and any sweeping statement as to what doctrines are generally accepted could quite properly be challenged. Avoiding these difficult questions of dogma, we are on safer ground if we indicate merely those tendencies of modern speculation which have demonstrated their usefulness; and chief among these is the so-called quantum theory. The definite article is misleading; there is not one quantum theory but many. But the common element of all these is the belief—first forced on the physicist by stubborn facts and later triumphantly applied in the conquest of new knowledge—that the processes of inanimate nature are fundamentally discontinuous, and that even the apparently continuous and determinate sequences of mechanical phenomena are but a composite statistical picture, made up of individual events which are governed by relations of probability.

Thus the apparent determinism which our laws postulate becomes only a practical determinism of a statistical result, based on a “fine-grained” indeterminism in the constituent atomic phenomena. Not that the physicist has formulated any such doctrine. Most of them would be shocked at finding that they have lent any support to such damnable heresy, denying as it does the invariability of the causal relation. But I at least can see no escape from this conclusion as the practical upshot of their train of thought. For it will be noted that the temporal relation of cause to effect is, from the statistical point of view, incompatible with the determinist postulate of invariability. Only on the assumption that something else may happen

can we assert what probably will happen. The development of modern physics makes at least conceivable the hypothesis that all the order to be found in nature is a statistical order, into the constituents of which there enters an element of indeterminism. Determinism has been dispensed with as a necessity of rational thought in so far as the thinking of men like Bohr and Einstein can be called rational. To see this clearly is our first need if we would bring our philosophy into line with our activity, and if I have made a beginning toward proving this one point, it is as much as I have a right to hope for. But much more remains to be done. The implications of this new cosmology in biology and psychology cut pretty deeply into current conceptions, for it is in the realm of probability that the living shows the widest divergence from the non-living. And it is above all here that there is need of a philosophy which does not deny its own significance,—to which possibilities are something more than illusion, and creative effort a reality.

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CAUSALITY AS AN ONTOLOGICAL RELATION

I

AN ontological relation, in the meaning of the present discussion, is a type of relation which contrasts with a logical relation. The contrast is this. A logical relation is a relation between logical elements, *e. g.* between concepts or propositions. An ontological relation is a relation between existential elements, *e. g.* between things or events. Thus a person says, "If X. . is a good flower garden, X. . will have roses." Presented in this statement among other items is a relation (a) between the propositions "X. . is a good flower garden" and "X will have roses," and (b) between the concept of good flower garden and the idea of roses. The concept of good flower garden is here presented as implying the idea of roses, and the proposition "X. . is a good flower garden" as implying the proposition "X. . will have roses." The relation presented in each case is a logical relation; it is the relation of implication. Consider, however, the statement, "My garden is next to that wood." Here also a relation is presented, the relation of next to, or contiguity. But this relation is not here a relation between propositions or concepts. The concept of my garden and the idea of that wood are not here presented as next to each other. Nor are any propositions. The relation here presented is rather between two particular existents, the garden and the wood. It is these two

particulars, perceptible, not conceptual, and occurrent in space and time, that are presented in the statement as next to each other. Such are ontological relations. They are such relations as contiguity, co-existence, succession, and the various other relations which hold, not between the universals of knowledge, but between the particulars of existence. The conviction behind this article is that causality, primarily and essentially, is also a relation of this type.

An influential belief in current philosophy is, however, that this certainly is not so. Causality, if it has any meaning at all, it is claimed, is a logical relation. It is a principle by which you can infer from certain propositions about events certain other propositions about events. Causality, on this view, is simply a special principle of inference. This position is taken, for instance, by McTaggart who holds that causality is a type of determination, "a determination of Implication. The cause implies the effect."¹ "Strictly speaking," he says, "implication is a relation between propositions, or truths, and not between events. But it is convenient to extend our use of it, so as to say that, if one proposition implies another, then the event asserted in the first implies the event asserted in the second."² Strictly speaking, however, as McTaggart says, causality is on this view a relation of implication between propositions about events. This general position, that causality is a type of logical determination between propositions about events, is adhered to also by Mr. Russell and Mr. Broad. Thus Mr. Broad: "The law of causality is perhaps the assertion that to every true proposition that asserts the happening of an event at a time there is a set of relevant true propositions such that relative to the whole

¹ The Meaning of Causality, *Mind*, N. S., Vol XXIV (1915), p. 326.

² *Ibid.*, p. 327.

of them the probability of the event happening is 1.”³ And again: “A cause in the most general sense is a set of successive sets of contemporary events from which other sets of events can be inferred.”⁴ That is, a cause is a set of logical abstractions from which another set can be inferred.⁵ Mr. Russell, who finds it difficult to speak his thoughts on causality in non-mathematical language, proposes the following definition as probably the nearest approach to a correct non-mathematical definition of a causal law: “There is a constant relation between the state of the universe at any instant and the rate of change in the rate at which any part of the universe is changing at that instant, and this relation is many-one, *i.e.* such that the rate of change in the rate of change is determinate when the state of the universe is given.”⁶ Cause and effect are here construed as a given state of the universe and a certain rate of change, and their relation (causality) is interpreted as a type of determination. This determination Mr. Russell warns us is a purely logical determination between wholly logical terms. “The law,” he says, “makes no difference between past and future: the future ‘determines’ the past in exactly the same sense in which the past ‘determines’ the future. The word ‘determine’, here, has a purely logical significance: a certain number of variables ‘determine’ another variable if that other variable is a function of them.”⁷

The chief aim of this article is to discuss causality as an ontological relation. But before doing this, I would like to indicate that the general contention of this Cambridge group, that causality is essentially a logical relation, the

³ *Perception, Physics, and Reality*, pp. 153-4.

⁴ *Ibid.*, p. 137.

⁵ *Cf. Scientific Thought*, p. 56.

⁶ “On the Notion of Cause,” *Proc. Aris. Soc.*, N.S., Vol. XIII (1912-13), p. 14.

⁷ *Ibid.*, p. 15.

relation of logical determination, is defective, and, if taken as adequate and complete, is invalid and false. To this task I shall devote section two, below. In section three I shall state the nature of causality as an ontological relation and endeavor to show that the defects of the logical-determination view are thereby overcome.

II

That there is some principle logically connecting propositions about events is of course undeniable and important. But to call this principle causality is, as I think, a mistake, and for two reasons: (1) the terms of the causal relation, cause and effect, lose, on this view, their distinctive character, whereas in common thought and in truth they are distinguishable and have a distinctive character; and (2) the relation of causality itself, on this view, loses its distinctive character and becomes indistinguishable from various other relations.

(1) The first point is admitted by McTaggart. "Our definition of causality," he says, "gives us no criterion for distinguishing one term as cause and the other as effect." "The course that I think most convenient therefore is to speak of causal relations as existing between terms, but not to speak of one of these terms as cause, and of the other as effect."⁸ Mr. Broad believes that the distinction be-

⁸ *Op. cit.*, p. 338.

tween cause and effect depends on the fact that many causal laws, as stated, are not reciprocal, so that in them as they stand one term determines the other, but not *vice versa*; the determining term is here the cause, the determined term the effect. "On the other hand," he says, "when the causal law becomes strictly reciprocal I doubt if it be possible any longer to give a reasonable meaning to the distinction between cause and effect."⁹ But if in a causal law cause and

⁹ *Perception, Physics, and Reality*, p. 127.

effect are taken in exactly equal generality, and this I think is theoretically possible if not practically feasible in any case of causality, the causal law becomes reciprocal, or the cause and the effect stated in the law become logically indeterminate.¹⁰ So here too there is theoretically no criterion for distinguishing cause and effect. Either term of the causal relation may, as you like, be called cause or effect. This first result of the logical-determination view of causality, may seem to some very unimportant. But I think it is quite important and for two reasons. In the first place, common sense (if I may here assume the toga) does make a distinction between cause and effect: thus it would say (to borrow an example from McTaggart) that drinking alcohol by A was the cause of the subsequent drunkenness in A, but it would never say that the subsequent drunkenness in A was the cause of the preceding drinking of alcohol. And in the second place, not only does common thought make this distinction between cause and effect, but it may admit as true that cause and effect *properly stated* do *logically* determine each other and still make the distinction. There is nothing in this admission, it may say, that cancels for it as it would for the logical-determination view, the distinction between cause and effect. Thus common thought may admit, as it is possible to claim, that the cause and the effect in the case under consideration may be stated in propositions that logically or in knowledge indetermine each other. Or more exactly still, it may admit that a proposition asserting the ex-

¹⁰ For instance, in the causal sequence friction-heat, if the effect (heat) is taken in a generality equal to that of the cause (friction)—*e.g.* taken as the heat produced by friction where the cause is taken as the friction that produces heat—then the heat if given logically determines the type of cause as much as the cause if given logically determines the type of effect. Thereby this typical logically non-reciprocal sequence becomes logically reciprocal, and on the view that causality is logical determination, as accepted by Mr. Broad, either term of the relation here may be called cause or effect. For an adequate discussion of reciprocal and non-reciprocal causal relations, the reader may be referred (*e.g.*) to H. W. B. Joseph, *An Introduction to Logic*, Chap. XXII.

istence of the cause (there exists at t drinking by A of M amount of alcohol) not only implies but is implied by a proposition asserting the existence of the effect (there exists at t' drunkenness of N amount in A). Given either of these propositions, and our knowledge is such that you may infer or argue to the other proposition. These propositions asserting causal existence, it may grant, are now logically interdeterminate. Nevertheless, common thought may insist on its original distinction. While propositions about the drinking and the drunkenness may stand to each other in this way, the drinking and the drunkenness, which are not propositions, it may say, still stand to each other in their original way. The drinking is the cause of the drunkenness and the drunkenness is not the cause but the effect of the drinking. What the logical-determination view says about the relation of a proposition asserting the cause to a proposition asserting the effect (that the former determines the latter) may be equally true of the relation of a proposition asserting the effect to a proposition asserting the cause. But a cause itself remains a cause, and an effect itself remains an effect, and the original distinction between the two, as discerned in common thought, is unaffected by this new information which has to do not with the cause and the effect themselves but with propositions phrased about them. This then is the first defect of the logical-determination view of causality. On this view cause determines effect solely in the sense that a proposition about the cause implies a proposition about the effect. But in this sense of determination (and causality it must be remembered is a relation of determination) an effect may as equally determine a cause as a cause an effect, so that on the logical-determination view cause and effect become indistinguishable in character and function, and either term of the causal relation may, as you like, be called cause

or effect. On the other hand, in common thought (and I think with truth) cause and effect are held to be originally distinct and to have an originally distinctive character, and this distinctiveness, which is based on a determination between the existents themselves and not between any propositions or other logical expressions about them, remains and cannot but remain in its original form untouched, when the logical-determination view, which concerns only propositions or other logical expressions, is allowed to say all it has to say about causal propositions.

(2) The second defect of the logical-determination view of causality is that on it the causal relation itself loses its distinctive character and becomes indistinguishable from various other relations. This is admitted by Mr. Russell who says, "Any case of sufficiently frequent sequence will be causal in our present sense; for example, we shall not refuse to say that night is the cause of day."¹¹ Thus causality and constant conjunction in sequence here fuse and are one. Again, Mr. Broad, who holds that "there seems to be no good ground for rejecting simultaneous causality in general,"¹² admits that "if we accept simultaneous causality at all there is no difference in principle between the connexion of cloven-footedness with chewing the cud and that between the momentary states of the fire and the water."¹³ That is, there is no difference in principle between a co-existence and a causal connexion. "In the example of cloven-footedness and ruminance," he indeed adds, "I think that we must admit that we have a very specialised case of a causal law."¹⁴ Thus co-existence as

¹¹ *Op. cit.*, p. 13.

¹² *Perception, Physics, and Reality*, p. 129.

¹³ *Ibid.*, p. 128. The causal relation fire-water referred to here is between a fire and the water it is boiling in a teakettle.

¹⁴ *Ibid.*, p. 130. This case is called very specialised because it is believed that it always appears only as a case of what Mr. Broad calls simultaneous immanent causality.

well as constant conjunction in sequence¹⁵ could be considered, from the logical-determination point of view, as types of causal connexions. And there would be other instances.¹⁶ Causality on the logical-determination view thus would blend with and becomes essentially indistinguishable from a whole set of relations commonly considered different from it. This outcome, as I think, is not welcome. And the reasons for this are not dissimilar from those set forth above in regard to the indistinction between cause and effect implied on the logical-determination theory. In the first place, common thought does make a distinction between a causal relation and a relation of the allied types—*e.g.* between causal connexion and co-existence. Thus it might grant that the distribution of light is the cause of the appearance to the normal eye of the green color of a living pine-cone, but it would never grant that the prickliness of the cone which is co-existent with the green, is the cause of the green. That, it would say, I think, is strictly a case of mere co-existence. But in the second place, not only does common thought make a distinction between causality and co-existence, but it may admit as true that, like a cause and an effect, a co-existent, if properly stated, may logically determine another co-existent. And still it may insist on its distinction. There is nothing in this admission, it may say, which cancels the distinction as

¹⁵ Mr. Broad would reject the conjunction of night and day as causal because it is analysable into other regularities. But if a constant conjunction in sequence were not so analysable, it appears, he would identify it as a causal connexion. *Op. cit.*, p. 130.

¹⁶ The reason why causality on the logical-determination view has the latitude we have noted is indeed that wherever you have factors in relation which are such that from propositions about the existence of the one you can infer the existence of the other, you have, on this view, a causal relation. This naturally leads to all sorts of cases of determination becoming causal. Thus, if in a continuous stream of events, two are given as separated for observation by an interval, it is determined logically that there is either an event or a set of events between the two given events. On the logical-determination view, the relation of the two given separate events and of the stream of events to the event or set of events of the interval, is the relation of cause to effect.

it sees it between causality and co-existence. Thus common thought may grant not only that a proposition about the existence of a cause (there is a certain distribution of light in the presence of that normal eye viewing that living pine-cone) implies or logically determines a proposition about the existence of an effect (there exists an appearance of green to that eye); but also that a proposition about the existence of one co-existent (this is the prickliness of a living pine-cone) implies or logically determines a proposition about the existence of a second co-existent (there is green here for a normal percipient under certain lighting conditions). Given the first proposition in either case, and our knowledge is such that you can infer or argue to the second proposition. The first determines the second. Nevertheless, common thought may insist that while propositions about the light and the green, and propositions about the prickliness and the green, may, in each case, stand to each other in this way and in the same way, the light and the green, and the prickliness and the green, which themselves are not propositions, still stand to each other in their original way, and these are different. The light and the appearance of green stand to each other as cause and effect and comprise a causal connexion; the prickliness and the green themselves stand to each other as associate co-existents and comprise together a co-existence. What the logical-determination view says of the relation between propositions about the existence of cause and effect may also be true of the relation of propositions about the existence of two co-existents. But a cause itself remains a cause, a co-existent remains a co-existent, and the original distinction between the two (and thus between the relations into which they enter), as discerned by common thought, is unaffected by this new information which has to do not with the cause and the co-existent themselves

but with propositions phrased about them. This then is the second defect in the logical-determination view of causality. On this view the causal relation itself loses its distinctive character and instances of constant conjunction in sequence, of co-existence and of other relations, being comprised of terms between which a logical determination may hold, may be called, if you like, causal connexions; whereas in common thought and as I think in fact causality and these allied relations are distinct, and this distinctiveness, which is based on the nature of the relation of the "terms" themselves and not on the nature of the relation of propositions or other logical expressions about the "terms," remains and cannot but remain untouched, when the logical-determination view, which concerns only propositions or other logical expressions and their relations, has been allowed to say all it has to say in regard to causal and allied propositions.

It would thus appear that the logical-determination view omits a good deal that is essential and distinctive in causality, and is therefore inadequate and false unless indeed the distinctions between cause and effect, and between causality and allied relations, which are clearly preserved in common thought and appear to be actual and real in fact, are themselves in the end ungrounded and false. I think that the distinctions made by common thought are real distinctions and can be shown to have ground and validity by stating and establishing an account of causality as an ontological relation. If this is so, and I shall try to show in the next section that it is, it would then certainly follow that the logical-determination view is as such untrue and invalid. This logical-determination account of causality, to be sure, is true and valid in the sense that a true account of causality will include a notice of the fact which we have already noted, that propositions about cause

and effect are logically determinate, even as a true account of causality will include some notice of the facts pointed out by Hume, that cause and effect are spatio-temporally "contiguous" or continuous.¹⁷ But the logical-determination account of causality is untrue and invalid, as is Hume's, if it is claimed, and this is the claim, that it contains the whole and essential meaning of causality.

III

I propose now to state as best I can the meaning of causality as an ontological relation. I do not of course hope, or propose to try, to solve the whole nest of problems that surround causation. I shall merely define the meaning of causality as ontological, and then, by commenting on the various parts of this definition, try to expand its meaning adequately, and defend the view which it supports against the more fundamental objections that would be made against it. In doing this we shall find, I think, that this account of causality is compatible with the truth that is in the logical determination view and is also, as valid, sufficient evidence for the validity of the distinctions between cause and effect and between causality and its allied relations preserved in common thought.

Causality as ontological, we may say, first of all, is a two-termed relation between changes or states, one or several of which are called the cause and one or several of which are called the effect. I will assume that there is such a reality as a relation, and moreover that it is understood what a relation is. These assumptions, I think, will be allowed. In order then to explain the above statement I will define the meaning of the first term of the causal relation, the cause. This, as will be seen, will clarify sufficiently the meaning of the other term of the relation, the

¹⁷ And perhaps also of the fact that the mind leaps forcefully and as if by necessity from the idea of a cause to its effect, thanks to psychological habit.

effect, and make a separate discussion of it superfluous.

A cause we will define as a change or a state which is existentially continuous with another change or state and which brings about, under the circumstances, the occurrence of the other change or state—the other change or state being called the effect. This definition has three main parts: (1) a cause is a change or a state, (2) this change or state is existentially continuous with another change or state, and (3) this change or state brings about, under the circumstances, the occurrence of the other change or state. I will now comment in turn on each of these main parts of the definition of cause, trying at once to expand their meaning and to remove the fundamental difficulties that may be felt to beset them.

(1) "A cause is a change or a state." This part of our definition presents few difficulties. Still there are several points worth noting about it. First, some have denied that there is such a reality as change. Change, they hold, is contradictory and since the real is at least non-contradictory, there can be no such reality as change. It is of course impossible here to state and examine the arguments on which this position rests although I hope to do this in another article.^{17a}

Fortunately however it is not necessary for the present argument to take this trouble. The position in question, while holding that change is unreal, does not deny that there is something that appears to be change, and moreover it does not at all deny states. This is sufficient. Cause in our definition then becomes, even allowing the arguments for the unreality of change to be valid, either an apparent change or a state, both of which have reality. The essential meaning of our definition of cause is thus

^{17a} This article, entitled "The Nature of Change," will appear in the next issue of *The Monist*.

not altered by the position denying reality to change. A second point in regard to this part of our definition concerns the fact that it states that a cause is *a* change or *a* state, the implication being that a cause is *one* change or *one* state. This is in certain cases of course true, but equally in certain other cases it is not at all true. Thus we do say that the overflowing of the ink from this pen onto this paper (one change) is the cause of the blot here on this paper (one state). But equally we say that the noises of the street (many changes) and the heat (one state) are the cause of my headache (one state), and such. This point is not very important. Our definition of cause is stated in terms of *a* change and *a* state because this is the simplest form of stating the nature of a cause. But it is clear, as I think, that the alternative to a change and a state, namely, "more than one change or state," can be inserted without compromise into the definition as it now stands. A final point in regard to this part of our definition is that the cause is here described as a *change* or a *state*, but no mention is made of *persons* or *things*. The implication is that a cause is never a person or a thing. I think this is true. Neither a person nor a thing is a term in the causal relation itself. The terms of the causal relation are always either changes, or states of persons or things.¹⁸ Such a view as this, it should be noted, eliminates as irrelevant to the causal concept the ancient and rather befogged notion of agent and patient—of the thing or person that is active or acts (agent, cause) and of the thing or person that is passive or suffers (patient, effect). I am inclined to think that no general objections or deep regrets will be expressed over this elimination.

¹⁸ More generally, it is true, the terms of the causal relation are always events—namely, in the sense that a change or a state must occur or be an occurrent to be a causal term. But in this sense of event someone may believe that a thing or a person is an event, in that each to be actual must occur or be an occurrent. For this reason we have spoken of the causal terms as merely changes or states, and not as events.

(2) "This change or state (the cause) is existentially *continuous* with another change or state (the effect)." This part of our definition introduces one of the major problems of causality—the problem of continuity, and more particularly, the problem of time and of the temporal continuity of cause and effect. This problem, stated in a very comprehensive form so as to include not merely the problem of continuity but also the problem of time in its connection with causality, may be expressed in the form of a rather complicated dilemma. It is this. Cause and effect must be either temporally simultaneous or temporally successive. But no matter which you hold they are, you have hopeless difficulties—unless perhaps you are willing to surrender yourself completely to some form of the logical-determination view of the causal relationship. For suppose cause and effect are simultaneous, then temporal passage becomes irrelevant to causality and the causal relation becomes one of timeless determination—*i.e.* logical determination.¹⁹ If however cause and effect are said to be successive, then, as successive, they must be held to be either sequentially continuous or discontinuous. But they cannot be either. For suppose cause and effect to be discontinuous, then there is a blank time between cause and effect during which the cause does not operate. And if the cause does not operate for a finite time, however short, why should it ever do so?²⁰ Moreover, on this view, you are committed to the position that something is brought into existence (the effect) by something that has ceased and gone out of existence (the cause)—surely an unwelcome view.²¹ Cause and effect cannot therefore be discontinuous. But suppose they are continuous, the result is no better. For then, if

¹⁹ Cf. Lotze, *Metaphysic*, Vol. 2, Sec. 207, referred to by Mr. Broad, *Perception, Physics, and Reality*, p. 122.

²⁰ Cf. Bradley, *Appearance and Reality*, pp. 60-61. (Eighth Impression).

²¹ Cf. Bosanquet, *Logic*, Vol. 1, Chap. VI.

you take an infinitely thin slice across the continuous stream of events, this slice will contain the cause of all that follows; and yet, since it will occupy no time at all, it will not be an existent.^{21a} Or, since this slice can itself be divided into an earlier and a later part, and this division never cease, the true cause of what will follow can never be really found.²² The result of this complicated dilemma, where positive, is, as I have suggested, that causality must be conceived, if at all, only as a timeless, logical relation of some sort—and that real time as a causal feature must be wiped off the books.

Let us, however, look more closely at this dilemma, which consists, it will be noted, of a major division and a subdilemma under the second part of the major division. And first the major division, which states that cause and effect must be temporally either simultaneous or successive. This does not seem to be true. In most cases of causality if not in all, cause and effect are both simultaneous and successive. Thus the water in the teakettle over the fire first boils at a moment when the heat of the fire is still being applied to it (simultaneous causality) and as the heat continues the boiling continues (simultaneous causality), but also the boiling of the water comes about usually only after the fire has been under the teakettle for some time (successive causality). Thus the major division of the dilemma does not present a real disjunction. This point however is probably of little importance. The important point is: is the conclusion said to follow from accepting either part of this major division (as is clear we accept in the main both parts)—namely that the only intelligible meaning of causality, if any, is causality as some sort of logical principle—one which nevertheless we must admit?

^{21a} Cf. Bradley, *loc. cit.*

²² Cf. Russell, *op. cit.*, p. 5.

And first does the fact that cause and effect are simultaneous, supposing it to be universal, mean that the only connexion between cause and effect is some sort of timeless, logical one? I do not think it does. For in the first place a logical connexion, as we observed at the outset of this paper, is strictly a connexion between concepts or propositions. But neither the boiling of the water in the teakettle over the fire, nor the fire, nor the heat of the fire, to illustrate from the above case, is a concept or a proposition. And this is generally true of the changes and states involved in causality, they are ontological, not logical, realities. But secondly the fact that changes or states occupy the same time (are simultaneous) does not in any case imply either that the changes or states are timeless or that their relation is timeless. In occupying the same time, the changes or states occupy at least a moment, the same moment, which is a finite time, and the same is true of their relation, which is also occurrent then. Temporality is thus an actual as well as a relevant feature of the terms and the relation. And finally the fact that causal changes or states occupy the same time does not make these changes or states, as one conclusion has it, logically related as expressions of the Law of Identity. States or changes are identical if they are the same in all their characteristics—not in one. Two stamps are not the same because they are sticky, nor are two eggs the same because they are both egg-shaped, and likewise in regard to states or changes. The fire under the teakettle is not the boiling of the water in the teakettle because they both have the same date. We are therefore forced to hold that the conclusion said to be forced by the acceptance of the first part of the major division of the dilemma—namely, that simultaneity of cause and effect means that all connexion between cause and effect becomes logical and atemporal and that cause

and effect themselves become timeless existents expressing, as some would have it, the logical Law of Identity—is utterly without warrant or foundation.

As to the second part of the major division of the dilemma, namely, that cause and effect are temporally successive, we may ask: does the fact that cause and effect are successive (as we have stated we believe that in most if not in all cases they are successive) imply, as the dilemma has it, a new and hopeless subdilemma as to the temporal continuity and discontinuity of cause and effect? In the second part of our definition of cause, which is now under consideration, we have said that cause and effect are existentially (that would at least mean, temporally) continuous. We are therefore committed to a rejection of the view that cause and effect are temporally discontinuous. The reasons for this rejection are many but the two stated in the above account (Bradley's and Bosanquet's) seem sufficient to warrant it. Cause and effect, in any case, we feel forced to hold are temporally continuous. Does not this, however, lead into the difficulties to which Bradley and Russell point? Does not this force us to hold that the cause is really a non-existent (Bradley) or at least that it must be impossible ever to arrive at the real, determinate cause of an effect (Russell)? I think that neither of these results follows from holding that cause and effect are, in our sense, temporally continuous.

By the temporal continuity of cause and effect we mean merely that between the occurrence of the total cause and the occurrence of the effect there is no temporal rift or break. The cause does not occur and cease, and then, after a lapse, the effect take place. The effect always takes place, whether the causality is simultaneous or successive or both, at such a time that between its occurrence and the occurrence of the total cause there is no temporal lapse or fis-

sure or break.²³ To some this may seem an odd idea of continuity. Indeed, the two objections stated above (Bradley's and Russell's) are based on deductions from a very different idea of continuity. This is the mathematical idea of continuity, according to which between any two members of a continuous series, such as cause and effect are taken to form, a third member can always be detected or inserted. The invalidity of these two objections, however, is due in part, to the very fact that they are based wholly on this mathematical idea. At all events, causal continuity in regard to time, as we conceive it, refers to an idea which *prima facie* is the very opposite, namely, that between the occurrence of the cause and the occurrence of the effect there never can be detected or inserted in that sequence a third change or state.

Let us briefly consider Mr. Bradley's and Mr. Russell's objections to causality conceived as a relation between continuous events. Both of these objections proceed fundamentally from the assumption that the continuous stream of events comprising a cause and an effect can be sliced into infinitely little slices or events, so that you may always reach, in searching for a cause, either an infinite subdivision which is a non-existent (Bradley) or no definitive or determinate sub-division at all (Russell). Now if this

²³ It might be objected that on this position wherein cause and effect are temporally unseparate, we are left without any but arbitrary and subjective means for distinguishing between cause and effect. Cf. e.g. A. E. Taylor, *Elements of Metaphysics*, p. 175. (Eighth Edition). This, as I think, is a mistake, parallel to the mistake of holding that cause and effect are identical because or when they occupy the same time. We shall see, in the third part of our definition of cause, that we have a definite "objective" basis for distinguishing cause and effect. But an example may at once show that there is no practical or theoretical difficulty in the way of discovering such a basis where cause and effect are nevertheless continuous in our sense. Thus in the case of the sequence heat-boiling, the boiling of the water (effect) always takes place at such a time that between its occurrence and the occurrence of the total cause, there is no temporal rift or break. Yet we can and always do distinguish the heat of the fire, which is the cause, and the boiling of the water, which is the effect. And this distinction is based, not on subjective or arbitrary grounds, but on what the heat and the boiling themselves are and on how they stand one to the other in this sequence. See (3) below.

assumption about the slicing of actual events is put forward as a fact, it is, as I think, certainly false. No one has the ability actually to slice up any sequence of causal events either into infinitely little events or into anything at all. And there are in ontologic fact no infinitely little events—they are conceptual fictions. If however this assumption is put forward as a deduction from the mathematical theory of continuity, and this, as I think, is in both cases its character, then we may say, (a) that so far as the continuity of cause and effect as states or changes is concerned, this is accurately and wholly expressed in the definition of continuity we have used so that in this regard the mathematical idea of continuity is superfluous, but we may also observe (b) that the mathematical idea of continuity anyway applies accurately only to conceptual entities, such as numbers, Euclidean points, and abstract 'events,' but is useless and indeed false if directly applied to actual events or changes or states or any ontological elements, which are not concepts. Thus the mathematical theory of continuity would assert that between any two members of an event-series a third member of that series, indeed an infinite number of members of that series, can always be found or inserted, whereas between any two ontological events that are temporally unseparate, such as the heat of the fire at the time when the boiling of the water in the teakettle has begun, this is just what in that event-series actually cannot be done. The mathematical idea of continuity thus is not only superfluous but worthless for expressing the ontological continuity of cause and effect. From this we may see that the two objections under consideration here, resting as they do upon deductions from the mathematical idea of continuity, are at once ineffective and irrelevant as objections to the temporal

continuity of cause and effect conceived in the sense in which we use that term.

I will conclude this comment on the second part of our definition of cause with a few words on the spatial continuity of cause and effect. This continuity, it will be remembered, together with temporal 'contiguity,' was insisted on by Hume as a clear objective feature or as a phase of the existential continuity of cause and effect. It seems true. The fire, to be sure, is spatially separated from the water in the teakettle, at least by the bottom of the kettle. Still, accurately speaking, the fire is not the cause of the boiling of the water in the kettle, the heat of the fire is the cause. And this in part enters into the kettle and thus is not spatially separated from the boiling which itself transpires there. Again, the ice in the ice-box is usually spatially separate from the food which, due to it, is cold, but here too the cause has been misstated. The cause is not the ice but the passage of air cooled by the ice to the food in the food-chambers, and this is spatially continuous with the coolness of the food which occurs to the food there. There seems then no reason for denying spatial continuity to cause and effect if we mean by this continuity merely that between cause and effect, at some place, there is no spatial rift or break and if we rule out irrelevant mathematical ideas of spatial continuity which accurately apply, not to ontological, but to conceptual space. We should not of course be too positive on this point. We believe that a sound from a distant object is caused by vibrations coming from that object and impinging on our ear-drums and starting vibrations there which in consciousness are the sound. And we believe that the movements of the planets are caused by the gravitational attraction between their masses which we picture as expressed in events in the ether between the planets. But there is as

yet no first-hand evidence, at least in the case of the planets, to prove this spatial continuity. The events in the ether at least seem on a par with the infinitely little events that are called for on the mathematical theory of continuity. There is however this difference that if there were in fact none of the infinitely little events called for on the mathematical theory of continuity, causality as ontological would still remain in full force, whereas, if there were actual proof that there were no intervenient events between the planets, we would undoubtedly say that there was no attraction between their masses and hence no causal connexion between the attraction of the planetary masses and their movements.

(3) "This change or state (the cause) also brings about, under the circumstances, the occurrence of the other change or state (the effect)." This third and final part of our definition of cause is the differentiating segment of the definition. By this the cause is described so that it may be distinguished from the effect—the cause is always the change or state which under the circumstances brings about another change or state, and the other change or state thereby brought about is always as such the effect. Here, we may also note, causality itself is assigned the character whereby it is to be distinguished from ontological relations such as constant conjunction in sequence and co-existence. These relations are not relations between terms which, as related by them, are marked by the characters of 'bringing about' and of 'being brought about.' Day, for instance, does not bring about night, nor night day (constant conjunction in sequence): each is brought about by a shift in the position of the hemispheres of the opaque earth in regard to the sun. And again, cloven-footedness does not bring about ruminance, or vice versa (co-existence): each is brought about, so far as we may say, by the develop-

ment, under certain circumstances, of certain elements in a germ-plasm. And this is generally true. The ontological relations other than causality do not connect existential facts which, as connected by them, are such that one brings about the occurrence of the other. This is true only of causality.

There are at least two questions that should be asked in regard to this third part of our definition: (a) does the notion of cause bringing about effect represent facts? that is, are there particular instances of it that are incontrovertible? and (b) can this notion, if it does represent facts, be made any further intelligible? I will consider these questions in the order in which I have stated them.

(a) I think that contrary to certain passages in Hume and to those who follow them, the notion that 'cause brings about effect' plainly represents facts. Thus, after an extended drought it is raining, and as it rains I observe a puddle of thickened rain-water to form in a hollow of the previously parched ground. In this case the cause is the falling of rain at this time to the hollow of the previously parched ground; the effect is the forming at this time in this hollow of the thickened puddle of rain-water. I submit that this cause, which is continuous in our sense with the effect, did, *under these circumstances*, bring about that effect. That, as I think, is a certain fact. Again, a man spreads a coat of brown paint over the surface of a table previously white. The surface becomes brown. I submit that this change from whiteness to brownness of the table's surface, which took place as the painting proceeded, (effect), was, *under these circumstances*, brought about by the spreading of the brown paint over the surface previously white (cause). Finally, a lighted match is applied to a bale of dry hay standing in an open field and the hay takes fire and burns. Again I submit that the

applying of the lighted match to the dry hay (cause), did, *under these circumstances*, bring about the burning of this hay (effect). To some these examples may seem ludicrously simple, but I fear we have little choice in this matter if we would indicate decisively to certain philosophers that the notion of cause bringing about effect does in truth represent firm and clear-cut facts.

(b) But can this notion of 'cause bringing about effect' be made any further intelligible? In a sense of course its nature is already somewhat intelligible. For since the notion represents clear facts, it is at least a piece of valid knowledge. We may go farther than this, however, in at least two directions. In the first place, the notion can be given a formal definition. Thus: by the assertion that one reality (the cause) brings about another reality (the effect) is meant that the occurrence of the second reality (the effect) is, under the circumstances, due to and determined by the existence of the first reality (the cause). This would be a precise or formal way of rendering the notion of cause bringing about effect and should be of aid to those who are fond of such things. In the second place, a further point may be noted. This is the rôle which the notion has as a basis for at least two types of necessity involved in causality. In a sense, I am inclined to think, we may deny necessity to causality. If we are asked: why, by what necessity, does cause bring about effect? I think that we can only reply in the end: cause brings about effect because cause brings about effect, it is the nature of a cause to do this. In other words, as I think, we cannot reach to any deeper necessity for cause bringing about effect than the fact that it simply does. We must merely accept as rock-bottom this attested truth. Still, I do not think we need to hold with Hume that this disposes of necessity in causality. Several types of necessity remain to causality,

of which two may be mentioned here since they are directly based on the truth of the notion that cause brings about effect. The first type may be called *ontological* necessity and the second type may be called *epistemological* necessity.²⁴ By the first type of necessity we mean that, since cause does in fact bring about effect, a reality, *if* it is a cause, is one whose *nature as an existent* must be to bring about an effect. We may not be able to say why the nature of this reality as an existent must be so, but that it is so we may certainly say if it is true that cause does bring about effect. Such is the ontological necessity in causality. It is that intractible necessity for bringing about an effect which resides in the *existential* nature of the cause. The other type of necessity directly based on the truth of the notion that cause brings about effect, is called epistemological necessity. This may be explained as follows: we have seen that the notion of a reality bringing about another reality supplies the differentiating character of causality, and is involved in no other relation, such as co-existence or constant conjunction. And we have seen that this notion represents clear facts. Since this notion is involved in causality alone, it follows that the concept of causality is required for a knowledge of an area of clear fact. This is what is meant by the epistemological necessity of causality. Causality is required or is a necessity for a *knowledge* of an area of clear fact.

IV

This completes our discussion of cause defined as a state or a change existentially continuous with another state or change and bringing about, under the circum-

²⁴ Another type is the hypothetical necessity of scientific causal laws. But it is impossible here to discuss this topic of necessity in causality at all adequately. One may consult, *e.g.* C. J. Ducasse, *Causation and the Types of Necessity* (University of Washington Publications in the Social Sciences, Vol. 1, No. 2), Chaps. 6 and 8, and Part III.

chief aim in this article has been to interpret and defend this definition and to indicate incidentally that in this concept of cause as ontological the distinctions between cause and effect, and between causality and allied ontological relations, felt by common thought, are accorded a place. These distinctions are valid if our concept of causality is stances, the occurrence of the other state or change. Our valid. The failure either to invalidate or to give place to these common-sense distinctions, we said, constitutes the chief blemish of the logical-determination theory of causation. This quite widely accepted theory, insofar as it is true—and it is true simply as stating the correct relation between *propositions* about causes and effects—remains, however, as a supplement wholly consistent with our own theory. This we have suggested. But if we wish, not a half-truth, but an adequate idea from which to survey problems such as the problems of causal analysis, of causal prediction, of universality and causality (to mention only a few of the causal problems), I think we must make merely a gruff bow to this logical-determination theory and endeavor, as we have, to understand causality not as a logical but as an ontological relation.

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DOES CONSCIOUSNESS EXIST?

THE Neo-realist seeks to solve the age long problem of the relation of body and mind by showing that these are not two substances but two forms of the same substance. In pursuance of this aim Bertrand Russell asks, in a recent work, "whether there is anything that we can call 'consciousness' in any sense involving a peculiar kind of stuff, or whether we can agree with William James that there is no 'inner duplicity' in the stuff of the world as we know it, and that the separation of it into knowing and what is known does not represent a fundamental dualism." He comes to the conclusion "that William James was right in his views on 'consciousness'."¹

In considering this problem anew I wish to examine some of the considerations that have led some thinkers to the denial of consciousness, or at least to a denial of its significance.

Traditional psychology concerned itself with the "inner world" of mental states, such as sensations, memories, volitions, images—which are, it held, discovered introspectively—leaving to physics and physiology the task of observing and describing the "outer world." The inner world, it held, is characterized by consciousness, the outer, by occupancy of space; the inner world is private, the outer, public; the outer world can indeed be measured with mathematical accuracy but can never be perceived except through

¹ *Philosophy*, New York, 1927, pp. 210, 217.

the medium of subjective modes of apprehension, while the inner world, although it defies such precise determination, can be, and it alone can be, directly observed.

But it was soon discovered that introspection is a very unreliable method of collecting data, since in the first place, it is necessarily limited to one's own mental states and consequently the field of observation is too restricted to allow of generalization. What right has anyone, it was asked, to base laws of mental conduct upon observations limited to himself? I cannot, by introspection, discover what others are thinking or feeling. How, then, can I know whether they think and feel as I do under similar circumstances?

The scope of introspective data is indeed enlarged if I accept at its face value the reports of the introspection of others. I can then check up my knowledge of my own mental states with what I learn from them as to their own, and conclusions based on the narrow range of my own experience are confirmed or corrected thereby. Thus the objection based on the narrowness of range of introspective data is to some extent met. But a second objection rises, namely, that the reports of others are meaningless to me unless I interpret them in terms of my own experience, so that I am still limited, in the last resort, to my own introspective data. If you tell me you see "green grass" or hear "violin music," your words do not open your experience to my introspection, but have for me such meaning only as "green grass" or "violin music" have had for me at some time or other,—only I now attribute this remembered or imagined experience to the biography of another and not to my own. If you are partly color blind, so that what you call green does not, *ex hypothesi*, look to you as green as it does to me but more like grey, or if you have a keen ear for harmonies and overtones so that vio-

lin music is richer in tonal quality for you than it is for me, I can discover neither fact, except either as you may report to me through other words (which again I must interpret in terms of my own experience) or as I observe your behavior (such as your failure to distinguish colors which I can distinguish or your showing greater ecstasy than I do) from which I infer a difference between your experience and mine; though it is as permissible for me to infer that your experiences are the same but that your responses are in the one case more, in the other less, inhibited than mine. Your own experience, *i.e.*, your mental states, are for me in any case matters of inference and interpretation. Introspection is forever limited to the introspecting subject himself.

But if I am forever excluded from experiencing your experiences, and can know what you are thinking or feeling only as I attribute to you thoughts and feelings similar to my own under like circumstances, as when I see you look at a picture and conclude that you are seeing it, or hear you say, "It is cold," and conclude you are chilly,—even though this be the case, is there nothing that can be indubitably and objectively concluded from the reports of the introspection of others? I give a number of people a set of colored discs and ask them to pick out the piece corresponding to a color shown them. If they all pick out the same piece, and if it be the one I would have picked out, I conclude that they can all discriminate color equally well and correctly, even though I cannot tell to what degree of intensity the colors differ for each of them or indeed whether any of them, being color blind, see all these colors as only shades of grey. I can observe how other people react to situations, in this case how they respond to similarity; but I know of no means by which I can discover

the exact quality of their experiences. That they have the same experiences as I have when they react as I do under similar circumstances,—this is an inference; for practical purposes perhaps a legitimate one, but one that must in any exactitude remain a matter of doubt to the end. I can observe your behavior, but not your mental states. Indeed, in the color experiment all that I have observed is that you respond in a certain way to certain stimulations. That your differing reactions to different color-stimuli is not merely a mechanical response of your nerves to varying wave-frequencies, but implies a conscious discrimination of seen colors, is a conclusion not depending upon observation but upon my habit of imputing mental states to others. That the subject of my experiment is conscious is something I have to assume, for consciousness is not an object or event I can observe in another. We shall soon see that even this assumption has been questioned.

Assuming for the present the fact of introspection, *i.e.*, that human beings have, and can observe, their own mental states and can report the results of their introspection to others whether by words or by behavior, there is a third objection to this method. The scientific observer ought to be a disinterested spectator, but this the introspectionist can never be. For if he be angry or in love or swayed by pity or fear, his self-observation is colored thereby; and if he takes time to collect himself and to adopt towards himself the unbiassed attitude of the scientific observer, he has thereby modified the states it was his intention to introspect. Scientific introspection would seem to be impossible; at best it is retrospection. And the objection to retrospection is not that memory is fallible—for even in extrospection I cannot both observe and record simultaneously, but must first observe, and then record from memory what I have previously observed, even if it be

only an instant before. But in the case of introspection, while the mood to be observed is occurring I am not even in a position to observe, but must later seek to recall how I felt or what I thought and then observe and record not the mood itself but the mood as remembered. But memory adds and subtracts, and cannot, in the case of introspection, be checked up by turning again to the fact under observation, as can be done in extrospection. For practical purposes introspection may work well enough, but as an instrument of scientific observation it lacks the precision desirable in the so-called exact sciences into whose ranks psychology aspires to enter. The apothecary dare not use scales that would be fully satisfactory to the coal merchant.

But if we cannot check up on our own introspection, can we not check up on the introspection of others as reported to us, by ourselves concurrently observing their behavior, for we can take that disinterested attitude towards their anger or love which they themselves cannot take at the time, and can observe gestures and grimaces of which they are unaware. But the behavior of sophisticated adults is very complex and full of inhibitions; it is easier at first to carry on our experiments with babies and animals. We are still assuming the validity of introspection—within the limits noted above—and are going to subject baby or animal to certain stimulations in order that we may observe the nature of its responses to the emotions which those stimulations are calculated to arouse. We shall make the baby or animal afraid or angry or jealous or happy—*i.e.*, we shall assume that we are arousing these emotions in it—and shall then observe its unsophisticated and uncensored responses. We shall thus be able to tell, as we think, what are the normal reactions to certain emotions and, conversely, to tell from one's behavior what emotions a person

is feeling, without waiting for his own introspection and verbal report.

I therefore arrange certain laboratory experiments for the observation of adults, babies and animals, to determine if possible the correlation between their behavior and their mental states. And suddenly it occurs to me that instead of correlating their behavior with their mental states, what I am doing is to interpret their behavior in terms of my own mental states. Their mental states are still a sealed book to me, if indeed I have any right to assume that they have mental states at all. For in the same way—but mistakenly as we now think—did primitive man attribute ideas and emotions to sun and trees and arrow. And that type of thought has left its traces in our language. We still say, "Water seeks its level" and "The moon is attracted by the earth," though we now realize that "search" and "attraction" are notions introduced from our own nature and are probably, indeed quite certainly, alien to water and moon. But modern psychology bids us be equally critical when speaking of animals and men. When, for example, I say of a singing bird, "How happy it is!" or see a dog wag its tail and say, "How it loves its master!" I may be reading too much into their behavior. The need for a mate may prompt the bird's song and perception of the source of its food the wagging of the dog's tail; nay, in both cases the behavior may be the result of glandular secretions merely and not of mental states at all. Note, however, that I cannot, so far as the argument has yet led us, deny the happiness of bird and dog, but neither can I indubitably affirm it, for I do not know whether animals react to situations with the same emotions as human beings, or indeed whether they have emotions and feelings at all. Indeed the doctrine is at least as old as Descartes that

animals, like plants and planets, are only machines, no more possessed of consciousness than sun or stone. All, then, that I can with certainty affirm about the bird and the dog is that the one is singing and the other wagging his tail. I can observe their behavior; but I cannot with any certainty correlate this with their mental states, and yet this is what I had hoped by these experiments to do.

And the same is true of savages, babes and infants, that it is difficult to determine their mental states. Is the savage's magic ritual the result of a semiconscious theory of the universe or merely the standardization of spontaneous fear and joy responses? Does the babe's cry mean colic or a pin? When a boy screws up his face and tells me he has a toothache can I believe him or not? In all such cases the behavior is directly observable to the outsider, but not the mental state which is supposed to accompany it. Indeed the question has been raised whether in any of these cases there is any mental state at all. Common-sense is agreed—although philosophers disagree—that there is no consciousness accompanying the stone's downward fall or the river's seaward flow; and our assurance that the same is true of plants is only a little less certain. The poet may sing, "I like to think that every flower enjoys the air it breathes," but common-sense calls that fancy and attributes enjoyment not to the flower but to ourselves in observing the flower. But if consciousness neither can be observed in stone or plant, nor need be attributed to them in any description of their behavior, may not the same be true of the monkey in the cage trying to get the banana, and even of human babies and adults, that the outside observer not only cannot observe their consciousness but does not even need to use the word "consciousness" in describing their behavior? Whether the person is asleep or awake the situation is the same; I can observe

no one else's states of mind, and I can describe his behavior without reference to such states.

This argument does not yet affirm that I can explain another's behavior without reference to his mental states, but only that I can so describe it. For, so far as I can see, it is theoretically possible, if not always easy or feasible, to describe another's behavior without any reference to mental states. And behaviorist psychology takes its stand on this fact, and on the related fact that, even if it were desirable to appeal to the consciousness of that other, such consciousness has to be imputed to him since it can in no wise be extrospected in him, and he is the only one who can introspect himself. Hence the behaviorist's dogma, that for the purpose of description consciousness is an irrelevant issue; that, indeed, it is not only irrelevant, but often serves merely to becloud the issue; serves, at best, as an excuse for laziness, as when I do not wish to take the pains or the time to observe a certain sequence of behavior through to the end, but observe only part and then say to myself, "That person *intends* to go to the postoffice" or "That monkey *desires* the banana." What I mean in these cases, says the behaviorist, is not that I have penetrated into and introspected the mind of man or monkey, or indeed that there is any mind, conscious intention or desire, there to be observed; but only that I have inferred, from so much of their behavior as I have observed, that were I to observe it long enough I would see the roving activity of man or of monkey cease when the one reaches the post-office or the other the banana. For the behaviorist, then, what we call "desire" in man or animal implies nothing more than the fact that the man or animal "is stimulated to restless activities which tend towards the performance of some reflex." "We cannot observe whether an animal *feels* satisfaction or *feels* discomfort; we can only observe

that it behaves in ways that we have become accustomed to interpret as signs of these feelings."² We observe, viz., that it is at one time restlessly roving and at another is at rest.

From this denial both of the observability of consciousness in others and also of its significance for description even if it could be observed, it is an easy step to the denial of consciousness altogether. Watson regards thinking as nothing more than laryngeal processes, and other behaviorists differ from Watson not in acknowledging a conscious process accompanying or in some other way related to physiological processes, but in refusing to limit thought to laryngeal processes only. Mental states, other than physiological processes, they all equally deny. "An image," says the behaviorist, "is the recurrence of the physiological state which originally accompanied a given stimulus, under conditions in which the external stimulus is not present." And again, "It seems to me that redness, as such, is just as much a construct as Russell says that matter is. Given two items, light-waves of a certain length and a retina in functional condition, we react with the word red. This qualia, redness, cannot be a part of the object, for that is composed only of electrons and protons in motion; nor can it be a part of the retina, for there is no redness stored there, to be added to the reaction; 'red' is simply our word-reaction to our own physiological state."³

Up to this point the behaviorist argument seems but common-sense. But at this point I must confess myself perplexed; for if there is one thing of which I feel most certain it is this, that I am at the present moment conscious,—indeed my "feeling of certainty" and my "consciousness" are here identical, mean the same thing,—con-

² Russell, *op. cit.*, pp. 90, 32.

³ Ross Stagner, "Reality Not Given in Presentation" (unpublished).

scious of brown desk and white walls, of my act of writing and of the ideas I am trying to convey thereby. Not, indeed, am I certain of all,—or, if you will, of any,—of the inferences based on the content of my consciousness. But that I am conscious of a content seems to me, as it did to Descartes and does to Russell, indubitable. People, says Russell, may be “somewhat wary as to the objective significance of their perceptions; but they have remained convinced that they really have the perceptions that they thought they had.”⁴ Indeed, if there were no content of consciousness there would be no point in affirming or denying its accuracy or even its existence, and no call for a theory to explain what is involved in the process ‘thinking I see.’ Whatever else, then, perception may be, it is not merely the compresence of objects in the same space with my ‘mind.’ It involves the awareness that they are compresent; or if you forbid me to use the word ‘awareness’ to explain what I mean by ‘consciousness’—since they are synonyms,—the best I can do is to define my consciousness of anything as the presence of that thing *for me*, as Hegel put it, and not merely *with me*; not for me in the sense of ‘for my sake,’ but for me in the sense that I have transcended the merely spatial relationship. The chair which I see is not “in my head” (Russell notwithstanding);⁵ but it is “in my mind,” not in the sense, of course, that mind is a containing medium, for that is to speak in terms of space, but in the sense that, in addition to the compresence of my body with other bodies in space, I am aware of the compresence of some but not of others. You may explain my being aware of some of these bodies and not of others

⁴ *Op. cit.*, p. 167. Cf. Turner, *A Theory of Direct Reality*, p. 25: “Time, space, motion, and innumerable other qualities are presented in this directly sensed content. . .; their actual *appearance* is unaffected by all our theories equally, for while these may explain its conditions they cannot alter its inherent character.”

⁵ *Op. cit.*, p. 138.

as due to the fact that "stimuli of various kinds are affecting my organism in one way or another;"⁶ but it does not follow that 'conscious of' means no more than 'affected by.' For it is of the desk itself as something out there in space that I am conscious, and not merely or primarily of its effect on me, *i. e.*, of some neural impression which I take to indicate the presence of a desk which, although in space, is not known in its spatial character but is only inferred as the unknown agent of my impressions. If, in the order of fact, awareness of an object is conditioned by sensory stimulation, in the order of knowledge the being aware of the object comes first and I advance the theory of sense organ and sensory stimulation to explain this awareness. It may be true, as the physiological psychologist affirms, that "I cannot conceive of an idea apart from a neural mechanism any more than I can conceive of the process of digestion going on apart from any mechanism for assimilating food."⁷ But the analogy is misleading, for whereas digestion is the physiological action of the stomach on a physical entity contained within it, ideation is not the physiological action of the neural mechanism upon anything inside or even in immediate spatio-temporal contact with it. To "see a chair" or to "think of Columbus discovering America" is not merely to have certain physiological processes going on in one's neural mechanism under immediate stimulation of sensory organs, originating in that part of space where the chair is or where that which made me think of Columbus is, though this sensory stimulation is undoubtedly occurring; but it is to know that this process refers to an object distant in space or an event distant in time. It is this 'objective reference' of my sensory and verbal responses to something which is entirely

⁶ Ross Stagner, *Constructive Evolution*, (unpublished), p. 13.

⁷ *Ibid.*, p. 14.

different and distant from them that constitutes the essence of awareness. Consciousness, then, is neither physiological process, on the one hand, nor is it, on the other hand, an intracranial and ghostly replica of the perceived object or a sort of diaphanous spiritual medium through which the object is perceived; it is simply the fact that the object is perceived. When therefore I say that of this I feel most certain, namely, that I am conscious, I do not mean that I am certain of the existence of Spiritual Substance of some sort, intracranial or external, but merely that I am seeing, hearing, thinking, desiring, and at this moment puzzling for words to express my meaning,—leaving the question as to what all this implies for future consideration. You may seek to explain my seeing, hearing, etc., in terms of the activity of a neural mechanism. But whether your explanation is correct or not, the seeing, hearing, thinking which it is calculated to explain—that surely *is*, else had there been no need of a theory to explain it.

That others cannot observe my thoughts, but can know what I am thinking only as I express my thoughts in words or deeds which they must then interpret in terms of what these words and deeds mean to them—this I see no reason to deny. My consciousness is not open to direct observation by others, but only my behavior. But from the proposition that consciousness cannot be observed extrospectively it does not follow that it cannot be observed at all, far less that there is no such process. Others cannot do my perceiving and thinking for me; shall I conclude that I am neither perceiving nor thinking, *i. e.*, that there is no more going on than others might observe, certain neural and muscular movements namely? Like the twelve fishermen of the Turkish story each of whom could count only eleven persons in the party because he failed to count himself, the behaviorist, unable to observe the consciousness of others,

affirms that there is no consciousness at all, because he has left himself, as conscious observer, out of the picture. On this point surely one can agree with Russell, "that self-observation can and does give us knowledge which is not part of physics, and that there is no reason to deny the reality of thought'.⁸ Far from its being true that consciousness cannot be observed, it is in one sense the one and only thing that can be observed, in this sense namely, that it is the condition of there being any observation whatsoever. Indeed are not observation and consciousness but two names for the same process? To observe a thing is to be conscious of it; and there can be no consciousness which is not the observation of something. So obvious does this seem to some, so eminently reasonable and incontrovertible, that when they find it denied—*i. e.*, when they find people who affirm that consciousness is not going on when I am observing something, but only a dance of neural atoms—they are forced either to conclude that all minds do not think alike, so that what seems eminently reasonable to one must needs seem wholly irrational to another,—but to admit this is to deny the possibility of rational converse with my fellows;—or else to conclude that those who deny the existence of consciousness are using the word to mean something other than what they mean by it to whom consciousness is, as I have already said, the necessary condition of all observation and hence the one thing that no psychological or other observer can dispense with as long as he is awake on his job. What, then, does the introspectionist mean by consciousness; and what does the extrospectionist mean by it when he denies that it is anything other than physiological process?

Consciousness, we are told by its critics, is a vague and intangible abstraction, belonging rather to the realm of

⁸ *Op. cit.*, p. 175.

superstitions and of ghosts, than to the realm of discernible reality. And it may be readily admitted that if you want me to show you consciousness abstracted from all objects of consciousness and existing purely by and for itself, that I cannot do. The consciousness which is the consciousness of nothing does not exist. It is an abstraction. Let this also be freely granted, that even when taken as a constituent element in a concrete whole, I cannot tell you where to look to see it or where to feel to touch it; for seeing and touching are methods of extrospection, and it has been admitted that consciousness is not extrospectively observable. Consciousness is not something seen but the seeing, not something touched but the touching,⁹ and it takes an act of thought, and not of sensation, to discriminate the process from the object. The behaviorist may indeed argue that the process of seeing is nothing other than the physiological process of looking, and that I can see both another person's looking, *i. e.*, his head and eye movements, as well as the object at which he is looking. But I do not see whether he is *seeing* the object, *i. e.*, is aware of it; I see only his looking and the object towards which his eyes are directed. Nor can I see my own seeing any more than I can see that of another. Even if I look in a mirror and there see my eye movements, it is not my seeing which I am seeing but only eye movements. "Seeing" cannot be seen but only "enjoyed," as Alexander says, or "introspectively observed," as the traditional psychologist says. I can by thought only, and not by sense, discriminate my being aware from that of which I am aware. And the reason for this would seem to be that awareness is not a substance to be perceived but is a feature of a complex situation, the subject-object situation, and taken by itself is an abstraction. But to call consciousness an abstract feature

⁹ By 'touching' is here meant not 'being in physical contact with' but 'having the sensation of contact.'

of a complex situation is not to call it an illusion; it is merely to affirm that awareness is not real by itself, but real only in the sense of being a distinguishable feature of a real situation. We must therefore use other means than sense impressions in our search for consciousness; not that we are to be anaesthetized before we search, but that we will not find consciousness as the object of sense, but as its condition.

If, then, consciousness is not the object of sense-perception but its condition, can one give a full and adequate account of it, point out unambiguously its nature, source, and rôle in the universe? This one can no more do than the physicist can give an adequate account of matter, for the completed account of the universe has not been achieved. The multiplicity of problems and the confused thinking that cluster around the notion of consciousness are not however a call to the clear thinker to drop so confused and baffling a notion, for the notion of matter would have to be abandoned on the same ground. It is rather a challenge to the thinker to make his notion progressively clearer. Inadequate theories to account for and explain the fact of awareness must be discarded, but not the fact they are calculated to explain.¹⁰

Shall I then seek to clarify my notion of consciousness by analyzing experience into its constituent and irreducible elements, and with the English neo-realists take consciousness as one of these irreducibles—although admittedly something which cannot be known in isolation but only in conjunction with some physical object which, on its side also, can be an object of knowledge only as it is co-present with this irreducible, consciousness? In so far as this theory means that there is such a situation as 'know-

¹⁰ See the article in *The New Republic*, January 2, 1929, "Behaviorist: *L'Enfant Terrible*," by Edward S. Robinson, for a fuller statement of this attitude.

ing,' it is common-sense. But if it means that consciousness could exist by itself independent of any content—and this is what the neo-realist probably does mean, for he is an advocate of the mutual independence of 'reals'—then it is just that kind of hypostatization of abstractions against which behaviorism so loudly and rightly protests. Shall I then pursue my analysis of the knowledge situation—including both the knower and the known—until, with American neo-realism, I at length attain absolute simplicity and irreducibility in those 'neutral' terms or events of which nothing further can be said than that they *are*; for, since they denote everything, they can connote nothing;¹¹ and, being the elements out of which anything and everything is to be constructed, must have no qualities of their own, so that they become indistinguishable from nothing, as Hegel long ago pointed out in his discussion of pure being?¹² From such absolutely simple and non-determinate terms does Holt seek to deduce the universe; but he is successful, if at all, only in so far as his deductive synthesis is but the reversal of the process of analysis by which he had originally arrived at his simples, and not because his simples contain in themselves aught whereby the deduction of complexes can be determined. Humbler than the deduction of reality out of nothing is the scientist's and the philosopher's task. It is his task to take what he finds as he finds it, and then seek to find his way about in it; *i. e.*, to explain experience not by showing why it should have been thus and not otherwise, but by showing how, being such a universe as it is, its parts and features are related to one another.

I can, then, not present consciousness to you as an

¹¹ Cf. E. B. Holt, *Concept of Consciousness*, p. 20, *et passim*.

¹² Hegel, *Logik Werke*, vol. 3, p. 73. For a discussion of the relative merits of analysis and synthesis in "The Search for Certainty" see an article by that title in the *Monist*, October, 1928.

object of that sense experience with which knowledge starts, nor of that completed rationalization which would constitute its goal; nor can I build it up for you *de novo* out of elements which do not contain it, though once having it I can analyze it and then reconstruct it as an exercise in logic. But, finally, I cannot even describe it to you in terms which shall make you aware of what it means unless you are already a conscious being, any more than I could describe redness to a man born blind. "A blind man," says Russell, "could know the whole of physics, but he could not know what things look like to people who can see, nor what is the difference between red and blue as seen. He could know all about wave lengths, but people knew the difference between red and blue as seen before they knew anything about wave lengths."¹³ When therefore, I speak to you of red and blue I am assuming that you have or have had visual experiences similar to those I have; for if you have not, my words as words mean nothing to you, and I am speechless in your presence; the rustling of the leaves would mean as much. Let me then assume that you have never had any experience similar to mine and I must perforce give up the attempt to communicate with you in words. But let me assume that you do indeed have experiences similar to mine, then if, when I speak of *sensations* of red and blue, you tell me that these words mean nothing to you but *physiological states of the retina*, I must conclude that you and I mean different things by our words, and not that you do not experience that which I call a sensation, any more than that my sensations are independent of the functioning of my retina. I must therefore assume a misunderstanding about words or a disagreement as to the further implications of our experiences, but not that I am experiencing something wholly alien to you.

¹³ *Op. cit.*, p. 174.

Now, the word 'consciousness' can convey no meaning to a being which is unconscious. If the reader should be unconscious—for he may conceivably be in a trance—he will not be aware of my words, and they will therefore be meaningless to him. But if he should react intelligently to these words I am surely justified in assuming that he is conscious of the words, *i. e.*, that he is thinking about them. And if you reply that what is going on in your case is not thinking but only physiological processes in a neural mechanism, I must, as above, assume that we both have the same experience but are using words differently to describe it. Let me then assume that the behaviorist and the introspectionist both have the same experience, are doing the same sort of thing that I mean when I say I am 'thinking' or am 'seeing the moon;' and our task shall be to discover if possible what meanings introspectionist and behaviorist attach to the word 'thinking' when the one affirms and the other denies that there is such a thing.

What then does the introspectionist mean when he says he is conscious or aware or thinking? He means (or at least I think he means) that he is observing something—doing exactly what the experimental psychologist is doing when he is observing, seeing, a rat in a maze. But the behaviorist will say, "All that is happening in my case is that certain physiological processes are occurring in my body, and more particularly in my neural mechanism; and what you call my awareness or observing is nothing but these processes, for I can find nothing over and above these to be called consciousness." What then shall I reply? Shall I not say, "My dear Sir, are you not observing a rat in a maze? If then there is nothing going on but physiological processes in your neural mechanism, is the so-called rat in the maze only another name for these pro-

cesses?¹⁴ Or in observing the rat, do you not refer these processes to something which exists outside your body and at some distance from your neural mechanism? Now it is just this 'objective reference' of your physiological processes that I mean, when I speak of your being aware of the rat." An observer, then, not only has physiological processes, but also knows that these processes mean something other than themselves. Knowing, therefore, cannot be a part of that physiological process, for not only does it transcend it in space and time, since knowing is not confined to the head where the process is supposed to be going on, but refers to objects and events outside the head; but it also differs in nature from this process, for knowing is no more like moving than red is like ambition. It is only in the interests of a quantitative theory that the qualitative difference between change of position and awareness of objects is ignored. It may be that no thinking can go on without accompanying physiological process; but to insist that thinking is only another name for that process is to lose sight both of the objective reference of thinking and also of its qualitative distinctness. It is not enough that a ray of light travelling towards me from the rat in the maze shall reach my eye and make its image on the retina, or travelling to the brain make some impress there,—the same thing can happen with the camera in place of my eye. But the camera does not *know* that it is perceiving a rat, nor indeed that it is perceiving at all, whereas the psychological observer is aware both that there is a rat out there and that he is observing it.

But surely the behaviorist will admit this much. What

¹⁴ Cf. Russell, *op. cit.*, pp. 138, 173. "My percept of a table is outside my percept of my head in my perceptual space, but it does not follow that it is outside my head as a physical object in physical space. . . . all my percepts are in my head, even the most distant star as I see it." Whether therefore I am perceiving a real rat or only an imaginary one, "in the case of the 'real' rat also (one's) primary datum ought to be considered introspective" as in the case of the imaginary rat.

motive then can he have for denying that 'knowing' is anything other than physiological process? He cannot mean that the 'rat' which he is observing is the physiological process, for he distinguishes between the two; or that in knowing, he is observing the process only, for he is aware of both; or, finally, that there is no observing going on, for he is proud of being a trained and accurate observer.

We have, I think, to go back to the dualistic epistemology of the Cartesians if we wish to understand the protest of the behaviorist and of the neo-realist against 'ideas.' According to the dualist, what I perceive when I see a rat in a maze is not the real rat itself but my idea or mental copy of the rat. My *idea* of a rat does not, then, in Cartesian terminology, mean my awareness that there is a rat; it means the mental image of a rat, of which image only am I directly aware. There are, then, on this hypothesis, two rats: the rat-as-seen or perceptual rat, to be discovered introspectively and consisting of mental stuff, and the rat-in-itself or physical rat, to be inferred but never discovered. The former, which alone I know directly, has the ontological status of a dream, the difference between dream objects and waking objects lying not in the substantiality of the latter, since both are alike mental, but in the orderliness attaching to the latter so that I have to assume the concurrent existence of a 'real' object as the explanation of this orderliness although I never perceive the 'real' object.

Neo-realism and behaviorism alike protest against this unnecessary reduplication of the object of knowledge, the perceived-but-unreal-rat and the never-to-be-perceived-but-real-rat. Russell does, it is true, provisionally reinstate the Cartesian dualism and calls the unperceivable rat 'real' or 'physical.' But his ultimate purpose is not dualistic. It is his purpose to turn the tables on the 'real' rat, popularly

so called, and prove it to be a logical construct merely, a class of events or percepts, the percepts alone being real. Between the rat and the perceiver there is, for Russell as for other monistic epistemologists, no third entity. But he achieves 'his monism by denying the reality of the 'physical' or so-called 'real' rat and maintaining that the 'perceptual' rat alone is real.

A similar refusal to acknowledge a third entity between perceiver and reality motives behaviorism. But instead of denying the ontological validity of the *physical rat* or rat outside of the head, as Russell does, (Russell is not always true to the logic of his position,) it is the *perceptual rat* or mental image inside the head that is denied. To see a rat in a maze is simply to see a rat in a maze and nothing else. What then of the intra-cranial 'percept,' 'image' or 'idea' of a rat which epistemological dualism places between perceiver and reality as the object preceived, and which Russell elevates to the dignity of reality? There is, says the behaviorist, no such thing; for when I search for something going on inside my head and mediating between rat and myself I find nothing 'mental' but only physiological processes, the activity of sense organs, brain and muscles. Now,—and this seems to be the logic of behaviorism,—if you give the names 'imaging,' 'perceiving,' 'knowing' to what goes on inside the head of the perceiver, and then if you find nothing there but these physiological processes, you will have made them identical with knowing and will affirm that this intracranial 'thinking' is nothing but, in slang terminology, 'brain waves.' That (a) between himself and the rat he is observing there is the relationship called 'knowing,' (which is not the merely spatial relationship of compresence, but is the awareness of that compresence), (b) that it is a real rat he is observing, and (c) that he is aware of what he is doing, is indeed 'thinking

about' the observed rat with a fair degree of logic and rationality such that he can write a book about it,—all this the behaviorist so fully takes for granted that he does not find it necessary to acknowledge it. When therefore others talk about 'consciousness,' he affirms that he can find no such thing, not, I should imagine, because he would deny that he is aware of or observing things, but because he does not find consciousness itself as an object or event inside his head, or, for that matter, outside.

A similar logic do we find in the behaviorist's treatment of memory. He asks me what I am remembering when I remember a past event. The obvious answer is that it is the past event itself I am remembering. To common-sense this is surely as evident as that when I see a rat I am seeing a rat. But, he will say to me, surely your remembering is a present event; how, then, by means of a present event do you remember a past event? And he gets me all confused, so that what once seemed obvious is now uncertain. How can I by a present act of remembering reinstate a past event? Surely what I am conscious of when I remember is the present act of remembering the past event and not the past event itself. Thus does he argue; and yet all the time it is the past event itself of which he and I are thinking and talking,—for if we were not thinking of the past event how should we know that the present act of remembering is not that past event? If I cannot know the past through my present act of knowing, the affirmation 'that I cannot know the past' is both meaningless and impossible.

The behaviorist, I take it, no more intends to deny that I can remember a past event than that I can see an external object. When he denies 'memory,' as formerly he denied 'ideas,' it is surely not this valid fact of remembering which he denies, but this third entity which is supposed to

come between me and the remembered event. According to the point of view which holds that when I perceive an external object it is not the external object itself but a mental copy thereof which I perceive, it is also held that when I remember a past event it is not the past event itself which I remember but a present mental copy of it, qualified in such a manner as to function as the 'memory' of the past event. Now this 'memory' which is neither the past event,—since the memory is a present one; nor the act of remembering,—since it is the object of that act; but is something which intervenes between the past event, which cannot be reinstated in memory but is nevertheless in some mysterious way known to have occurred, and the act of remembering, which does not really remember a past event but only perceives a present memory of the event,—all this fol-de-rol would the behaviorist sweep aside. When, apart from past event and present act of remembering it, I look inside my head for 'memory images' I find only physiological processes. If I am a good visualizer I may see in memory the breakfast table I left an hour ago; but this visualization brings before me not a table in my head but the breakfast table in the other room. When therefore I 'look inside my head'—and it is interesting to note that this is what both Russell and the behaviorist take 'introspection' to mean—I find there neither the real breakfast table nor a mental copy thereof, but only retina, optic nerve, brain, and their activity. In as far as memory is a process going on inside the head this is all it is. This is surely common-sense, and if this is what the behaviorist means we can surely agree. Not that remembering is physiological process, but that to remember a past event is to know that there was such an event, and not to be limited to the contemplation of a hypothetical mental copy of that event. It is surely this hypothetical intra-cranial mental

memory-copy which behaviorism intends to deny, and not the fact of remembering.

To conclude, if the behaviorist had meant what his critics took him to mean,—viz. that there is no such thing as perceiving objects, remembering events, and thinking about them,—then we should have had to acknowledge that he and his critics possess two diametrically opposed types of intellect, so constituted that what seems most reasonable to the one is arrant nonsense to the other, and what seems most certain to the one is to the other most uncertain. But if we admit this, then must we deny all possibility of intelligent converse between the two. If, on the other hand, we assume that the behaviorist and his critic are both sane and sincere, and sufficiently similar in their experiences that they can hold intelligent converse, we must then ask ourselves what 'consciousness' can mean to him who affirms that it is the one thing most certain, and what to him who affirms that he can find no such thing. We find, I think, that the two use the word to mean different things. When the introspectionist speaks of consciousness he means the self-transcendence of the physiological process, its objective reference, this fact of meaning something other than itself. But sometimes he has talked as if consciousness were a substance, an object, were such a thing indeed as might, like sun and moon, continue to exist even if no one were conscious of it. It is consciousness in this second sense that the behaviorist denies, and surely with ample justification, even as Hegel had, a century gone by, already pointed out that mind is subject, not substance. But in denying a false concept of consciousness the behaviorist tends to overlook the other meaning of the word and so goes too far. For it is only because he is *conscious* of the abuses that have crept into philosophy under the aegis of

this somewhat baffling idea that he finds it desirable to deny its validity. Were he not conscious, he would neither affirm nor deny. If then his words had meant what at first sight they seemed to mean, I must either write him down a fool for holding views that to me are utterly incomprehensible, or myself a fool for utterly failing to comprehend him. It is more flattering to both of us to suppose that he means something else, something comprehensible to both. This paper is an attempt to state what he probably does mean and to express agreement with him if this interpretation be correct. The critic of behaviorism may have been condemning an attitude which the behaviorist himself does not hold; but the behaviorist has laid himself open to misunderstanding through his terminology, that is, through identifying 'consciousness' with the discarded 'ideas' of epistemological dualism.

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NEO-PTOLEMAISM IN RELIGION¹

THE spirit of our times is hospitable to novelties. It is predisposed to believe that what is later is more desirable, and that what is new is, if not good, at least better. On occasion, this spirit is even deliberately capitalized. At any rate, a proclamation of novelty is almost invariably issued whenever grounds therefor are at hand. In the realm of theory, however, continuity is an asset, as it is the rule. Hence it is that we have acquired a large number of neo-isms. In philosophy, we hear much of neo-realism, neo-Kantianism, neo-idealism, the new naturalism, the new psychology, and the new morality. To this exploiting of novelty by terminology, however, there is one conspicuous exception. It is to be found in the case of that particular doctrine in the philosophy of religion which might fittingly have been christened neo-Ptolemaism. This designation, however, has remained without adoption. The proponents of the view in question have preferred instead to claim part title, along with other groups, to the label 'humanism.'

Within the religious outlook, man's estimates of himself and of his importance in the sight of his deities have oscillated widely. Speaking of western Christianity however—as we shall for the most part do in all that follows—one may safely say that dominantly, and in comparison

¹ Read as the address of the President of the Midwestern Division of the American Theological Society, before the autumn meeting of the Division, in Chicago, November 25, 1929.

with other things of the created world, the individual and the society to which he belongs have occupied an exceedingly enviable status; indeed, they have been regarded as in the focus of divine regard. Herein lay one of the chief sources of the psychological strength of geocentrism. To the religious consciousness of medievalism man and his abode seemed indisputably to belong at the very center of God's cosmos. Hence the severe attack that was made upon the rising Copernicanism. To be sure it has sometimes been said that Copernicanism affected simply the externals of the contemporary Christianity. Emphasis is placed on the fact that the new doctrine made untenable the more crassly anthropomorphic conceptions of God and shattered existing notions as to the locations of heaven and hell, and, indeed, the prevailing cosmology in general. That this was indeed the result of Copernicanism, and, what is more far-reaching still, that the very principle of authority was threatened by it, is obvious even to the first glance. But a second look will disclose one thing more, and it is especially this that disturbed so profoundly the religious sentiments of the day. In an order within which the earth itself is subsidiary to another celestial body, and is but part of a system that in turn is of but microscopic significance in the incalculably vast multiplicity of worlds extending into a limitless beyond, how difficult to preserve the religiously vital sense of the supreme worth of man or the conviction that upon him is centered the divine thought and love.

Thus it was only through a fierce and prolonged wrestling of the spirit, and as the issue of the most poignant suffering, that man eventually won his way to religious serenity within the cosmos that displaced Ptolemaism. Irresistibly, even though slowly, the measureless enlargement of the spatial order, and the ultimate demolition of the

narrow time dimensions of biblical cosmology, prepared the way for a magnified conception of the object of religious devotion. They led to a god-idea of immensely greater comprehensiveness, as in the case of the Spinozists, for example, or of vastly enhanced power and majesty, among circles which held fast to the doctrine of transcendence. In this latter case, God was likewise credited with an unspeakably deep love, for, despite his indescribable power and glory, he was nevertheless conceived to brood over man and to hold precious each individual soul. The religion that thus evolved throbbed with a truly cosmic emotion and in so far proved infinitely sustaining and deep. Nevertheless, it easily led to a haunting realization that the ways and thoughts of a god such as it came to possess could no longer be conceived in analogy with those of his creatures. God at such times seemed afar off. In seeking him many confronted a yawning gulf so broad that even their most active imaginations were abruptly checked at its brink. Beyond the utmost reach of imagery and definite ideas, the god that had come to be was suspected, in due course, of an inability to make himself directly heard by the human soul or felt in the events of nature and history. In consequence, he lost his appeal to many a religious consciousness. He became as unreal as he was remote.

Involved in this issue were influences connected with the development that culminated in Newton's *Principia*. The period was one that gradually brought to consolidation the idea of invariable laws of nature. Among the educated classes, at any rate, the external world came to be regarded as an inexorable order of events. Because of its rigorous and rationally luminous structure, the science of mechanics became the model for knowledge generally. As regards physical nature, tenable and objective knowledge was construed in terms of data which relate to events within a

spatial and temporal world and which are organized by various pervasive principles, particularly that of causality. The known world, that which constitutes the object of rational self-conscious experience and of science, was conceived as a unified order of elements or substances existing in spatial and temporal relationships and conformable to universal laws of causation. Such a world cannot admit the effective invasion of specific activities on the part of a transcendent will or being. God was thus shorn of his direct practical rôle in the world of man's knowledge and practical concerns. He could survive only as an absentee power, without real influence upon or within the existing world order, but related thereto, in any practically significant way, only at some point in the infinitely distant past when, for aught that is demonstrable to the contrary, he may have brought it into being. The consequence was that, however much or little he might factor in cosmological theories, he could not retain for the religious consciousness that vital and centrally significant place which he had previously held.

But the religious spirit demands attachment, for religion is a mode of consciousness that is directed upon, and finds its orientation in, an object. Under the circumstances this object was not unnaturally sought among the realities more immediately at hand than was the pale figure of the far distant god of the speculative imagination. So the search turned to the empirical order of space and time. May there not be, it was queried, within the very bounds of the earth itself and of the life of history as it has run its course and plunges into the future, something to which the religious spirit may turn for the fulfillment of its needs? This question took crystallization midst a welter of influences that conspired to divert the interests of men to the values and the possibilities of the historical life of man-

kind: influences connected with a rising knowledge of the rich civilizations of antiquity and the deep satisfactions which they mediated; with the discovery of new lands and untold resources holding forth high promise to men of adventurous courage; with the elaboration of modes of investigation yielding a type of knowledge that pointed the way to the control of nature and of man, and that therefore spelled power; with the growth of social and political liberty and the increasing emancipation of the individual from direct ecclesiastical interference; with freer social contacts and widening sympathies. Thus came a changed orientation and a new set of values. With a fuller sense of indebtedness to others that had gone before, with a deepened gratitude that intensified the spirit of social devotion, and with an enhanced power born of scientific knowledge, it seemed that perhaps an individual might satisfy the full requirements of his nature through the direction of his conscious interests, and the unreserved dedication of his energies, to his life within, and to the furtherance of, that human society of which he is a member. It seemed that he might perhaps establish a religiously significant relation of gratitude and high respect, if not of worship, and of determined moral service, if not of ultimate confidence, to that obviously real and thoroughly empirical order of spirits to whom he seems so obviously indebted for much that he deeply prizes and to whom he owes and may zealously render his utmost devotion. For is not such a relationship one that is free from outworn superstitions and from solicitations to vain illusions, one that unifies life, meets its most insistent demands, and provides adequate opportunity for the expression of all its capabilities? Have we not in mankind a religious object that remains for us solid and compellingly real, thoroughly convincing in its contrast with the imaginings of the in-

veterate theologian and the airy speculations of the cosmologist and metaphysician; an object of rational and controlled emotions rather than of vague feelings and mystic sentimentalities; an object directive of practically significant and socially valuable conduct in lieu of strange and futile cult activities? Thus arose the call to an anthropocentrism and a neo-Ptolemaism in religion.

Odd, nevertheless, the phenomenon in part remains. It was in a large measure faithfulness to the leadings of science that originally impelled deeply reluctant men to abandon the sheltered confines of Ptolemaism and to strike out into the wide expanses of reality, there to carry on their religious lives midst limitless horizons. Today the same faithfulness is appealed to—among other factors—in behalf of a retreat from the larger cosmos to a tiny world thereof, in order that, unexposed to besetting vagaries and threatening confusion, man may possess an object indubitably real while yet allegedly worthy of religious attitudes and adequate for religious needs. The movement in question has, to be sure, been a spiral one. The end is significantly different from the beginning. The religious society of original Ptolemaism included transcendent members—these indeed were its rulers, among whom one was vested with autocratic and absolute powers. Such members, however, modern sentiments of democracy, and the empirical, if not the positivistic, notions of today, preclude us from retaining within the religious group, or from giving even a speculative recognition. Accordingly the earlier dependence upon the divine has been superseded by reliance on one's self and one's human fellows. The sense of helplessness has given way to confidence in the power born of scientific knowledge and sustained by the enthusiasm of an unyielding will. The petitioner has become the creator.

Thus, while we again today have a Ptolemaism in re-

ligion, this is not a mere reversion but is clearly neo-Ptolemaism. It involves an outright and consistently maintained rejection of the transcendental. Moreover, it thinks of religion in terms of the requirements of human life in its relations to the empirical environment. It regards its function as essentially practical, and hence strongly tends to identify religion with social idealism.² It is essentially anthropocentric. Nature for it seems for the most part but incidental, receiving serious consideration only insofar as it impinges on human aspirations or affords a leverage for human advancement. Whether it presupposes or implies a comprehensive world view or a metaphysics is a point concerning which its spokesmen speak hesitatingly yet seem disagreed.

II

Humanism is evidence that religion must perpetually reckon afresh with all the various forces of culture. Whatever may be the teachings or the implications of religion regarding the enjoyment of peaceful bliss, it itself, since the age of self-consciousness, has quite generally been in the thick of things, and it is probably doomed to perpetual strife. Realignments in social and institutional life, and radical shifts in the nature and relative strength of human interests, introduce conditions in which religion is unable to enjoy the immunities of a mere bystander or a neutral. Such changes have always impinged upon it, sometimes for good but again ominously. In modern times, for example, state, school, hospital, club, social agency, community and cultural centers, and the like, have exhibited

² In view of the difficulty which this doctrine has in giving to religion genuinely distinct functions and values, must one not suspect that the retention by its representatives of the good old word "religion" evidences simply a reluctance to forego the sentimental assets of a term? Living in such a glass house, neo-Ptolemaists might prudently refrain from continuing an analogous charge against those who retain the term "God" in spite of the fact that they are unable to give it a definition either precise or adequate for logical requirements.

an independence and have asserted prerogatives proportional to their rapidly increasing vigor. In the face of them, religious institutions have continuously felt compelled to fight for the preservation of distinctive functions, that is to say, for their vitality. Shifting indeed have here been the areas of competition and the lines of conflict. In some form or another, however, religion has been involved in them ever since institutional life has tended towards increasing differentiation and specialization, and its various organs have intensified their claims to independence.

When we take note of religion's attempts to stake out her claims in the realm of human interests and values, the past centuries present a record of claims and counterclaims. Conflicts in views and theory have been unintermittent. Religion entered the modern scene as the revealer and mediator of the transcendent, and by virtue hereof as rightfully dominant in all phases of the life and culture of the individual and of society. What this means in one of its aspects is vividly portrayed by James Bryce in a passage which, though familiar, continues to stir our imaginations. "A life in the church," we read in *The Holy Roman Empire*, "through the church; a life which she blessed in mass at morning and sent to peaceful rest by the vesper hymn; a life which she supported by the constantly recurring stimulus of the sacraments, relieving it by confession, purifying it by penance, admonishing it by the presentations of visible objects for contemplation and worship, this was the life which they of the Middle Ages conceived of as the rightful life of many, the ideal of all. The unseen world was so unceasingly pointed to, and its dependence on the scene so intensely felt, that the barrier between the two seemed to disappear." In medieval Christianity the full sweep of religion was in evidence. As the guardian of truths and values eternal and unchallengeable, the or-

gans of religion held the rôle of arbiter in thought, taste, and conduct. The direction of all the several lines of temporal pursuits was in their hands. The kingdoms of this world and those of truth were assigned by religious authority to their respective provinces. Reality as a whole was deemed a hierarchy of forms and values. The lower substances, it was thought, indeed actualize their own distinctive forms, yet they were believed to possess a wider meaning. They were conceived as the material conditions for the actualization of the next higher forms, leading to man, who, in turn, aspires to the realization of a rational life, culminating at length in the contemplation of God. Thus the final reality and the goal of all nature was found in God. Knowledge reached completion when it passed over into religion and attained a conscious realization that everything must be construed as pointing towards God.

Thus religion was for a time the uncontested ruler over all the domains alike of idea and ideal. But then revolutions broke forth. Religion found herself confronted by a succession of vigorous claimants who sought at once to deprive her of her celestial domain and to secure for themselves increasing powers and eventually even undivided authority in one after another of those realms previously subordinate to her. Though religion was gradually forced to reckon with these claims, and to come to terms with them, she has stubbornly resisted complete surrender. She has sought to preserve for herself some territory beneath the sun, some place all her own within the system of human values and active cultural interests. This has involved her in perpetual intellectual conflicts down to the very present.

The struggles that ensued have been on shifting fronts. Generally speaking, the first challenge to religion was in

respect to her claims to the field of knowledge. Here she had not restricted herself to affirmations regarding the transcendent but, characteristically, had set forth and defended as infallibly true many specific teachings concerning the earth and its relation to the firmament and its bodies; concerning the forms of life that occupy the earth, more especially man—his origin, nature, needs and salvation; concerning human history, particular events of its past and still to come, as well as a sweeping philosophy of its meaning as a divine drama. Scientific investigation, however, pursuing paths of its own by use of a new compass and of novel methods, reached results divergent from religious teachings, even negating some that seemed to be of foundational significance. The new results were no less capable than the earlier of organization into comprehensive systems; on the other hand, they possessed the tremendously convincing advantage of definite vindication by phenomena of perceptual experience, as well as of conferring upon man extensive powers in the way of prediction and control. Suffering from these heavy handicaps, the dictums of religion were unable to maintain themselves. Ever more widely and clearly it came to be recognized that the facts of nature and of history, of man's own being and that of society, could be captured by scientific procedure alone, and that those who commanded the specialized techniques of the various sciences must be given the protectorate over the domains of truth. Of all these, then, extending to the outermost boundaries of actual or possible experience, religion was dispossessed. Religion, it was felt, could not be respected unless it renounced its claims to satisfy man's cognitive needs. If it undertook to assert itself in this field it was exposed to the peril of losing the genuine respect of all who would not be traitors to the truth as declared by a critical and disciplined reason operating with scientific

method. Thus, then, one of the main constituents of human culture acquired emancipation.

Many there were who long continued to argue that, while science was an organ of truth, its findings were in essential harmony with what religion had long taught. The attempt was to prove that, although science made its discoveries independently, the same teachings had previously been proclaimed by religion. This attempt, however, was so awkward or led to such casuistry and violent perversion of plain meanings that those who sponsored it fell under the wide-spread suspicion of ignorance, stupidity, or duplicity. The outcome was the generally accepted belief that scientific knowledge is not merely authoritative as respects questions of specific fact but that it also represents something altogether distinct, in character and intent, in point of view and in conclusions, from anything which religion is competent to undertake. He who would read the books of nature and of life in prose must go to disciplines that are independent of religion.

In some quarters, to be sure, the question was raised whether religion did not possess the cognitive function of supplying the truth about a supernatural and a metempirical world. But how, it was answered, can there be knowledge of anything that does not fall within that ordered realm of events which constitutes our world of space and time? How, indeed, can we as much as know that there is a God, since no deduction or argument can with confidence carry us to any reality that falls outside such a world? Thus it was, for example, that an examination of rationally grounded theistic arguments convinced Kant of their irremediably defective nature.

Today it has become clear that even this negative conclusion of the *Alleszermalmer* of Koenigsberg was not without positive significance to religion. What was crushed

was a formalism and at most an abstract rationalism which, whatever its powers to charm the theologian, was of no vital importance to religion but on the contrary was even a decoy luring religion to extinction. Not upon the materials destroyed by Kant does or can religion sustain itself. Then, also, Kant's argument, whatever its ravages, left to religion a number of distinct possibilities in the economy of human interests and life. Did not the critical philosopher himself say that his removal of knowledge prepared the way for faith? Or may not perhaps the experience of beauty mediate a living consciousness of ultimate purpose and value as expressed in that world of phenomena which we know? Or, again, may not religion perhaps have a share in the domain of conduct? Indeed, is it certain that man's rational nature is triadic, and that outside truth as the value of the intellect, beauty as the value of sensibility, and goodness as the value of will, there remains no other function of consciousness with a corresponding value in the culture of society? All of these possibilities, and others, were explored, and need to be re-explored, before passing to the conclusion that religion is not an independent feature or type of experience but that the word survives and, for sentiment's sake, we will preserve it under the shelter of social idealism.

Now while Kant had contended that the limitations of knowledge leave room for faith, it was soon apparent that in his doctrine, as most generally formulated, faith reintroduced the very conception of God to which the rationalistic procedure of contemporary deism had come. If, however, religion is an expression of faith rather than the pursuit or the conclusions of knowledge, this faith is certainly not one that simply reinstates conceptions originated by a knowledge that has stepped beyond its legitimate boundaries. Hence various thinkers renewed the attempts

to extend the scope of knowledge beyond the frontiers of what Kant conceived as the phenomenal world. The result was a considerable variety of contentions. For example, it was urged that one need but interpret as regulative the various principles which Kant regarded as constitutive of experience, and scientific knowledge appears in its true light, namely as something partial and abstract, requiring completion through more concrete modes of apprehension and the use of categories capable of yielding wider and more coherent systems of fact and meaning. Or, again, one need but take seriously the correlativity of the subject and object within experience, and realize that, as regards both its existence and nature, the object is dependent upon the subject, to understand that spirit is a central feature of reality, if indeed it is not the absolute within whose experience the correlatives of subject and object, and all relativities, are included. Still again we are asked to bear in mind that science has discarded the view of inert lump matter in favor of a dynamic conception; that the principle of causality can no longer be regarded as holding of all entities within reality; that the appearance of continuous and determinate orders of events is but a mask of discontinuity, due to the fact that individual events, subject alone to laws of probability, are taken *en masse*; that evolution must be recognized as a process not of the unfolding of something given but of the emergence of much that is genuinely new. When considerations such as these are kept in view, it is urged, we find indicated a conception of reality significant to the religious spirit. Or, still again, it is argued that the events which constitute the actual world must be construed as individuations or materializations or embodiments of universals or subsistents which constitute the wider realm of reality, and that a principle of concretion must be recognized if we would

deal at all seriously with the problem of our empirical order of fact in its relation to the subsistential realm. These allusions to different metaphysical doctrines need not be multiplied in illustration of widely prevalent contentions that the limits to which Kant restricted knowledge are altogether too narrow and that reason may and does yield a metaphysics which in no wise confronts us with the simple alternative of a humanistic religion or a religion that retreats to realms impenetrable to knowledge and presumably the creation of desires rebuffed by the circumstances of real life.

Humanists, as was above indicated, have differed on the question whether their doctrine of religion either implies or is implied by some specific form or forms of metaphysical outlook. Some there are who would keep their religious thesis clear of any connection with a cosmology or general philosophy. Others, however, represent it as the logical resultant of an empirical approach to philosophy and, in particular, of naturalism, either of the reductive or of the evolutionary type. The strength of these positions, however, is then assumed rather than seriously argued. If it is reductive naturalism that is taken as the ground of religious neo-Ptolemaism, the stability of the latter is indeed precarious. For if the history of philosophy has taught any lessons at all, one of them assuredly is the fact that a disregard of certain features of a situation, for specialized scientific or other purposes, does not in fact annihilate these features, much less cause them never to have been at all. The philosophy which starts with the body of knowledge represented by some one of the mathematical or natural sciences, and asserts that this exhausts the fullness of whatever may be called real, and that reality is nothing but what appears in the selected body of knowledge, is certainly very naive or stubbornly blind and un-

teachable. So much is affirmed even by naturalisms of the evolutionary stamp. Those humanists, however, who appeal to a naturalism of this latter sort need to give more careful scrutiny than they have as yet done to the question whether their religious thesis does as a matter of fact follow from the philosophy they invoke. The theistic conclusions to which Lloyd Morgan came are at least a warning to this effect.

There is a further consideration of such significance in this connection that it may not be passed without a word. Whatever may be the particular background of naturalism against which religious neo-Ptolemaists project their views, it involves the doctrine that man is thorough-goingly organic to nature. He sprang from the loins of nature, and from its resources he has drawn his growth and powers. His natural history is his complete history. Once, however, this theme is developed by neo-Ptolemaists, generally by way of a radical antithesis to the dualisms of supernatural and transcendental philosophies, the mood shifts from the major into the minor key. Nature is now supposed to be alien to man. The physical environment, at any rate, is construed as hostile to his finer ambitions or, at the very least, as unsuited to his spiritual realization. Creatures of neglect and enmity, like birds of a feather generally, tend to become all the more deeply united and attached to one another. So human beings, recoiling from the cold and perilous cosmos, find in their relations to one another the requisite strength and objectives for the highest living. To a critic this recovery of good from an alien and hostile world seems but another testimony to man's ineffaceable tendency to give a favorable reading to his environment.

It must indeed be fully admitted that no person should, and that no serious person will, be content to keep his re-

ligion in a water-tight compartment, unexposed to the currents of scientific and philosophic thought. These currents must be allowed free opportunity to transform so far as they may the religious outlook and experience of the individual. A shift in world view should and will reflect itself in religious feeling and action. Conceding all of this without reservation, it must nevertheless be remembered that a world view should not be dictated by any one phase or element or specialized interpretation of experience—by sense perception, mathematics, any one of the sciences or even all of them collectively, aesthetic appreciation, ethical values, or religious attitudes. In metaphysics, as in political life, conformity to principles may legitimately be exacted only where the constituent members have been allowed an influence in the shaping of the ruling norms.

Humanists, in epitome, are not agreed as to whether their doctrine derives its strength from the fact that it is implied by a certain method or doctrine of philosophy; those who hold that it is, have failed to demonstrate that the relation of implication does as a matter of fact hold; and even were the relation established, the doctrine would have all the uncertainty that attaches to the basic philosophy. He would be reckless indeed who alleged that humanism is dictated by the present state of scientific and philosophic knowledge. Such a contention should be but the last resort of a humanist after he had failed to induce conviction through a psychological analysis of experience or through appeal to the facts of religious development.

What light, we would now turn to ask, may be gained from those who teach that we may catch the distinctive spirit and expression of religion in connection with the aesthetic experience? Of those who have so taught perhaps it is Fries who will best serve our present purposes. For, on the one hand, Fries specifies those experiences

which *prima facie* impress us as disclosing within our phenomenal world the presence of the real and the divine; they are, he teaches, feelings of purposiveness that attach to our apprehensions of the beautiful and the sublime. This analysis of experience, moreover, Fries supplements with an elaborate argument designed to substantiate the validity of these impressions or feelings of purposiveness.

As convenient an approach as any to Fries's doctrine will be by way of the argument through which he seeks to establish what type of experience it is in which that which is real and divine might be expected to manifest itself. This argument rests on a conviction, strongly fortified by Kant's *Transcendental Dialectic*, that reason by its very structure leads to antinomies whenever it addresses itself to ultimate problems. For, knowledge must be of the definite and limited, whereas reason is dissatisfied with anything short of the infinite and unlimited. All attempts to conceive the latter, however, yield an apprehension of but the limited. Everywhere thought experiences a limit, yet no less certainly has it, as the very precondition of this experience, transcended the limit in question. That a radical antinomy may infect reality is not credible, so long especially as we may ascribe the antinomy to the very structure of thought. In sum, cognition is capable of presenting only a phenomenal world. The world of real being, though to reason a necessary and a priori idea or ideal, remains as to its nature an object of faith. Regarding it the only legitimate affirmations are denials of those limitations that pervade our known and knowable world; we may assert of it absence of conditions, or freedom and eternity, and absence of compositeness and multiplicity, or unity, such as is represented by God. Man, however, is not a knower only but also a moral agent. He pursues ends, and these, when morally required, are not conditional,

hypothetical and instrumental but are unconditioned and categorical; they are absolute and self-validating, and as such they do not point to anything beyond themselves. Such an unconditioned end is moral perfection. Here, then, we have the clue to the character of an absolute. Thus do we acquire the connotation of that conception of ultimate and real being which to thought is a necessary idea but is through it definable only by way of negations of the limitations of the world as known. Reality, that is, is a realm in which the moral end, that is, the absolute, is realized; it is a society of morally perfect beings completely harmonious with the ruling will of God. But reason will not rest at this point. It demands a unification of the real and the phenomenal orders. It harbors a conviction that there is a significant connection between the two. If such a connection obtains, the phenomenal order must involve an expression or revelation of ultimate reality. Since, now, our clue to the nature of the real is furnished by moral experience, we must conceive reality in terms of purpose. Hence we may conclude that the unique feature of the phenomenal world in which reality expresses itself is that of purposiveness. Purposiveness, however, can be shown not to be a valid category of theoretical interpretation; we may in consequence be sure that it is a feature of the world that we intuit or feel rather than know. Now Fries held that in the contemplation of beautiful or sublime phenomena of nature, works of art, or human personalities we have a convincing feeling of purposiveness, and the argument which we have just sketched is utilized by him to validate the claims of this feeling. The feeling itself he construes as divination and as representing man's religious nature. Thus, though conceding to an independent theoretical interest the cultivation of a knowledge that is organized by universal principles, Fries retains for religion

the function of yielding, by way of a characteristically aesthetic experience, a genuine glimpse of the real and the divine.

But is such a view unimpeachable? Obviously not, if only for the reason that it is extremely doubtful whether aesthetic contemplation under ordinary circumstances actually involves such a sense of purposiveness. Moreover, the aesthetic experience is in essence one of enjoyment. Religious experience, in contrast, contains an element of poignancy: consider, for example, the repentance and remorse inevitable when a consciousness of the divine impels an individual to an honest probing of himself. Is, furthermore, the religious experience one singly of admiration and adoration, or does it likewise carry an urge to deeds of service? Is, for example, the Christian's attitude toward Jesus, *qua* religious, that of admiration and aesthetic satisfaction alone, or also that of a discipleship which, refusing in contemplation to detach itself from the world and to escape its tragedies, endeavors, through its discipleship and sacrificial living, to vivify the experience of a universal source of finite spirits and to promote the claims of social justice and good will? Still again, is religion a consciousness of ultimate, static, and changeless being, or an active relationship to a living will operating to sustain whatever incorporates values and to create new worlds and heavens? In short, aesthetic sensibility, in common with the truth quest, lacks features which religion must be conceded to possess. Whatever may be the connection of the aesthetic or the cognitive life with religion, neither the one nor the other is to be identified with religion or is to be regarded as disclosing in some way a metempirical, supernatural world where religion dwells apart.

Does this suggest the conclusion that the characteristic spirit of religion is to be found in the activity of volition as

this culminates in the moral life and more especially in humanistic loyalties? Anthropologically speaking, of course, religion and morality have at times been quite distinct. The former has declared indispensable acts with reference to which morality as such was quite indifferent or to which, indeed, it was even hostile; and, conversely, lines of conduct dictated by morality have been outside the purview of religion or on occasion even condemned by it. At developed levels this cleavage strongly tends to disappear, but now we find that the moral consciousness, having become reflective, insists that moral principles, *qua* moral, are independent of supernatural origin or extrinsic sanctions. Morality postulates the autonomy of the rational agent or it ceases to be more than a hollow sound. At this point in his thought, Kant, under the pressure of finding a distinctive rôle for religion, referred to it, in its subjective aspect, as the recognition of all our duties as divine commands. The thought is difficult to maintain. Whoever lives as he ought, according to Kant, serves God in the only manner acceptable to reason. And it is not desirable that the thought of God be superadded to the consciousness of the moral imperative, else the purity of the ethical motive may be prejudiced, and man may be tempted to act from other considerations than solely out of reverent obedience to the commands of duty. In any case, morality stands in no greater need of a religion other than itself than does knowledge. It must ascertain its duties by ways characteristic of itself, and these duties must be faced without regard to considerations relating to any world other than that of physical nature, the human individual, and concrete social life. However moral theories may diverge, they are today essentially at one in holding that the discovery of what is ethically required and the motivations for living accordingly are matters for which

religion need not be invoked. Such discovery is properly the task of intelligence or of the moral reason, and such motivation must be sought in developed and socialized feeling-impulse.

Morality, like knowledge and art, expresses the life of reason and develops in the soil of experience. It comes to fulfillment in the form of a distinguishable and autonomous human interest. Like cognition and sensibility, volition opens no window into the hyperempirical toward which religion may turn and thus differentiate itself from all that concerns itself with the empirical. Religion, however, has always been more intimately associated with ethical living than with either truth-seeking or the enjoyment of beauty. In view of these considerations would we not do well frankly to identify religion with morality? Such seems to be in the minds of many who have reached humanistic conclusions. They construe the primary functions of consciousness as cognition, feeling and will, and their goals as truth, beauty and goodness; and they concede to each of these primary functions thorough autonomy in its own expression. On the other hand, they reject all notions of a transcendent reality. What other conclusion is possible, they seem to feel, than that the only reasonable view of religion is in terms of social idealism.

More recently than Comte, and over a path all his own, the profound philosopher Hermann Cohen reached a kindred view. Religion, he pointed out, had its origin in myth. The same is true of science, art, and morality. These, however, speedily freed themselves from the conditions of their origin and pursued independent lines appropriate to them. Religion, on the other hand, seemed for a long time to depend upon its association with myth; it seemed to feel gods and other elements of mythology to be indispensable. Yet the germs of something higher were

here too manifest far earlier than is sometimes believed. The development from polytheism to monotheism, for example, is not so much a matter merely of a reduction in the number of gods as it is a renunciation of mythology in favor of morality. The change was vitally connected with the transition from the performance of cult acts to the exercise of justice and mercy toward one's fellows and the manifestation of the humility becoming to man. Polytheism is not so much a form of religion as it is a manifestation of mythology. Religion in the true sense of the term was born with monotheism—it is the child of the ethical consciousness, and it is true to itself only in the form of humanitarianism.

It was by an independent line of reasoning that Paul Natorp came to the conclusion suggested by the title of his book, *Religion within the Bounds of Humanity*, obviously a paraphrase of the title of Kant's major work on the subject. As an orthodox neo-Kantian Natorp held with rigid consistency to the doctrine that reason knows nought of the transcendent and that religion must therefore renounce all attachment thereto. Religion is an expression of feeling. By feeling, however, we must understand the basis and the matrix of all mental life, whether it be that of cognition in the form of ideas, of will in the form of purposes, or of imagination in the form of aesthetic symbols. These latter, each in its own restricted and definitely limited way, are grounded in feeling; they are, moreover, accompanied by feeling, which seeks ever to incorporate them within itself and in turn to express itself through them. Thus feeling itself is boundless and infinite. Unfortunately, however, this infinite nature of feeling has often been regarded as a feeling of the infinite. When this has occurred religion has been interpreted as a relation to the transcendent. Once the fallacy has been seen, how-

ever, it becomes clear that religion, to command intellectual respect and grip the minds of men, must restrict itself to the bounds of humanity.

While there are other versions of the bases of humanistic religion which might legitimately claim attention, we must leave them unmentioned in order now to cast a backward glance at those which we have just sketched. In the case of Natorp, it will be noticed, the transcendent is irrevocably banished; science, morality and art are given a very high degree of independence of the infinite matrix of feeling, and are allowed to move on mutually independent lines; religion, while completely detached from everything of a transcendent nature, still possesses a distinctive function, that of expressing the essential unity and harmony of the conscious life in all its typical activities, and of giving to the latter warmth even though not direction. The antithesis of the "is" and the "ought" led Kant to the postulate of a basic reality which, as the source of nature and of duty, affected their harmony; the very same antithesis led Natorp to the doctrine that the world of scientific knowledge and the system of moral imperatives are alike ultimately grounded in a unitary consciousness which has the form of feeling. The feeling itself is directly experienced in religion. Thus it is religion that establishes and reinforces the conviction that what volition develops as morally required must be possible in the world of being created by the activity of cognition. While Natorp describes his doctrine as religion within the bounds of humanity, it is clear that for him religion is not identical with social idealism or moral endeavor; rather does it testify to and reinforce the conviction of the essential unity and harmony of man's conscious life. Now Hermann Cohen, too, came with increasing clarity to differentiate religion from morality. At no time, moreover, did he

advocate the elimination of the god-idea. Though holding that it corresponds with no actual being, he urged that, as in the case of the eighth century prophets of Judaism, it sustains the thought of the unity of mankind; through it we are assisted beyond a quasi-atomistic conception of society to a vivid realization of mankind as a totality within which the life of the individual falls. Moreover, the god-idea expresses the postulate that the world presents no insuperable barriers to the development of human character but, on the contrary, offers the conditions requisite for an unending progress in morality. The individual as such, furthermore, namely in his thought of himself as an autonomous and independent being, has needs which require the god-idea. He is conscious of himself as sinful and the function of god is to assure him of forgiveness and to restore him to the tasks of ethical freedom.

III

Auguste Comte's retention of the emotional, ceremonial and ecclesiastical aspects of Roman Catholicism might perhaps be explained as a lingering survival of forms impressive even though antiquated, or as the expression of an unsound mind. Cohen's account of the necessity of the god-idea for ethical convictions, and for the concept of humanity as a reality and a supreme value, might be attributed to an excessive preoccupation with, and an entanglement in, the dualisms and the individualism of Kant; and his doctrine of its necessity for freeing the individual from the consciousness of guilt and inspiring him to the free exercise of his moral vocation might be characterized as the death gasp of a pre-modern conception of human nature. Natorp's retention of religion as testimony of the unity of man's conscious functions and as guarantee of the conviction that fact and value, actuality and moral re-

quirement, are not permanently divorced might be charged with an arbitrary disregard of empirical observations and scientifically established facts.

Press these considerations as far as we may, however, we shall still find that the refusal to deny a distinctive rôle to religion was due, especially in the cases of Cohen and Natorp, to the seriousness with which they faced the facts of religion as they present themselves in historical phenomena and in living personal experience. That they held themselves within the limits they did might perhaps even be attributed to the restricted possibilities of the philosophies to which they were committed. Otherwise it seems not impossible that they might have been led into the paths of Schleiermacher and those who, with this great Romanticist, have found it necessary to trace religion to an independent mental factor, whether a feeling of absolute dependence, creature feeling or a sense of the numinous; or of those who have believed it necessary frankly to recognize a religious *a priori*, whether in the transcendental-critical meaning of Kant or in a psychological sense. Not merely a Schleiermacher, an Otto and a Troeltsch have thus stressed the uniqueness of religion. Even such thinkers as Windelband and the Baden school, in spite of resultant intellectual complications, have felt bound to acknowledge that religion carries us beyond the limits of theoretical, aesthetic and ethical experience as such. They have taught that it affords a mode of consciousness which forever precludes us from contentment with that which is or may be empirically actual, and that it holds before us the spiritual necessity of reverent compliance with an over-individual imperative. In the case of all of these scholars, the holy has the status of a category independent of truth, beauty and goodness, though this independence, to be sure, is far less pronounced in the case of Cohen and

Natorp than in that of the other writers whom we have subsequently mentioned. For these latter, moreover, even as for Cohen and Natorp, though to a less extent, religion is not without intimate relations to science, art, and morality, for these all are expressions of the unitary life of mind and reveal features of concrete reality.

The strength of recent humanism is in no small measure a by-product of man's amazing achievements since the rise of modern science, and of his confidence in the accelerating rapidity with which future successes are possible. Small wonder indeed that we find a widespread sense of power and of self-reliance. Nature has lost much of her stark terror; things are seen as malleable materials for the realization of human purposes. Is it not, however, sheer blindness to deny that defeat is as genuine a feature of human endeavor as is success, and that even the success that may be gained in relation to nature and life is pre-conditioned by an obedient regard for laws and structures that must be taken as fact? Whether we may properly speak of an instinct or innate tendency to submission is indeed disputable; what is not so, however, is the fact that nature exhibits many stubborn features, some of them precarious and others bound, so far as can be seen, to frustrate the hopes of natural man. That one is living in such a wider world, *within* which fall such successes as human wit may achieve, inasmuch as *of* it the human individual is but a constituent, is an inevitable experience at the level of self-conscious reflection. With this experience comes a realization that in the interests of his own integrity, the individual must win an adjustment of his total self to this world, along with an increasing knowledge of its nature, appreciation of its beauty, and aspiration to express and enhance its life.

The order of nature and the social realm are indeed

theatres of action, and within them man, individually and collectively, may, through the power of intelligently and imaginatively guided effort, increasingly realize his volitions. But only one such as a Fichte in his Jena years can seriously construe so much even as physical nature alone as but the sensuous material of our duty. For this the independence of our environing world is too pronounced and its claims for recognition and acknowledgement are too forceful. Let it not be said that helplessness is a state peculiarly characteristic of primitive man, as is therefore also the belief in gods; that the course of the past three centuries has given to man the right and the privilege of restricting his spiritual concerns to the discovery of fresh ends and of means for their achievement. Increased knowledge brings augmented power, but it likewise brings to the sober mind an intensified consciousness of that illimitably vast order within which human action is but an incident, and by which there is sustained and made possible such action as does occur.

What we have rapidly and roughly sought to sketch is the way in which that object emerges which carries upon it the indelible stamp of reality. And surely historical testimony and the witness of personal experience agree in the thesis that religion is a quest for the real such as the Hindu has voiced in his prayer: "Lead me from the unreal to the real; from darkness into light; from death into immortality." The concrete character of the reality which is the religious object depends in every given case upon the range and the depth of our experiencing, and upon the development of reflective knowledge. The relative strength of self-assurance may vary, as may that of other-reliance; such assurance and reliance, however, always dwell together. The call to moral effort and humanitarian devotion may be insistent and inescapable, but with it comes a

realization that final issues are outside the reach of prediction and human determination, and comes also a confidence that these issues may be acquiesced in when judged, not by present hopes and values, but by the self which, through a rationally humble attitude towards reality and the religious object, through repentant realization of his own nature, and through spiritual effort, perpetually undergoes profound reconstruction.

Religion is distinct from the reflective pursuit of truth in that it affords a sense of a concrete and ultimate totality, which is a sense of reality: with entire truth has it been said that "the category of reality belongs not to science but to religion." It is distinct from the quest of beauty in that it arouses the moral passion and the capacity for dedicated action. It is distinct from the life of humanistic devotion by the fact that it places this life within its cosmic setting and includes an adventure of faith which, however paradoxical the fact, nevertheless actually does afford a present enjoyment of the good, a prophetic realization of that which to moral aspiration is a distant goal.

Certain notions of the transcendent came in the advance of science to be thrown into the discard. As a result hereof, and of the redirection of interest to present possibilities and fruitions, the specific emotions and attitudes associated with these notions withered at their roots. There is, however, nothing in the scientific or philosophic teaching of today that forces the religious spirit to retreat from the reality that is sensed to be the most ultimate, and to protect and shelter its sensitive soul by restricting its consciousness to the compass of practical concerns for human well-being. The most comprehensive body of truth afforded by modern science is neither of such a nature nor of such solidity and security as needs to frighten any but timid souls; and philosophical criticism has reached a point

where, though disagreeing as to precisely what science is competent to yield, we may unite in holding that this may not be regarded as either final or absolute knowledge. The limits of science by no means extend to the boundaries of the real. Scientific advances but disclose more clearly the vastnesses of the unknown that lies beyond. Scientific methods are abstract and thus afford results that are relative to the limited purposes underlying their use. Any adequate appreciation of these facts but confirms that sense of reverent wonder which at once vitalizes the spirit of religion and animates the labors of the philosopher.

To man's apprehension of reality aesthetic experience must likewise make its full contributions. Like knowledge this experience ultimately roots in that total experience resulting when self-conscious man, in the full range of his receptivity, faces and appropriates the world within which he finds himself. And the fruits of art, as those of knowledge, will be absorbed by the religious experience, and will in due course fructify life and human culture as a whole. Ethical aspiration and living, too, have their sources in that matrix of experience which represents man's total appreciative reaction toward the reality ultimate for him. Thus they acquire and retain their depth, and therefore will they issue in a comprehensiveness which in self-transcendence carries them beyond the frontiers of humanity to a reverent attitude towards the whole of life and reality, in the realization of a unity by virtue of which all are comprised within that cosmos which has come to consciousness in those bits of itself which are we. That feeling of oneness with the universe, reinforced by advancing science, experienced in the presence of beauty, and culminating the morally earnest life when this is serious and comprehensive, reconstructive of its values, and conscious of its matrix, is in one of its expressions religion itself. Re-

ligion has a cosmic reference. It reaches out beyond the world of realized knowledge and values to an encompassing whole. Science affords a large part of its creed and theology, though for religion, as for philosophy, this creed and theology are symbols and myths. Our purposes to reform our attitudes and practices, and to dedicate our powers to the specific requirements of that world which is expressed by and in ourselves, is the religious sacrifice. Our reverent wonder, our faith, and our unhesitating and unflinching submission are our worship. The call of religion, thus, is not to the confines of humanism and neo-Ptolemaism, but to the wider reaches foreshadowed by the largest universe of present knowledge and the most comprehensive aesthetic and moral values as yet within our ken.

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THE SUBJECTIVISM OF THE NEO-PRAGMATIC THEORY OF KNOWLEDGE

NEO-pragmatism, so we learn, marks the later stage and the more critical phase of pragmatism. It seems to have become necessary for two reasons: first of all, in order to "force critics to be more precise in the statement of the doctrine they are criticising," when they attack either pragmatism or at any rate what they seem to have misunderstood pragmatism to be; and, in the second place, because even the neo-pragmatist himself finds it necessary to admit that "where there is so much smoke there is undoubtedly some fire," and that "there have remained elements within the pragmatic attitude capable of giving rise to such interpretations." Thus, at any rate, we are informed by Professor Charles W. Morris, who, in a number of recent articles,¹ has not only given us the word but has expounded the neo-pragmatic theory of knowledge. It will be the purpose of the present discussion to examine this theory, especially with reference to its emphatic claim of having transcended not only the positions of the dualist and of the objectivist, but also that of the subjectivist.²

First let us briefly state this neo-pragmatic theory of knowledge as it has been *more precisely* stated by Professor Morris. To begin with "the neo-pragmatic theory of knowledge renounces completely the doctrine that experience is a revelation of and a knowledge of something independent of experience." (p. 504)³ In other words,

¹ This position is set forth in a series of articles which have appeared in *The Journal of Philosophy* and in *The Monist* during 1927 and 1928, viz. "The Concept of the Symbol," *Journal of Philosophy*, vol. XXIV (1927), pp. 253-262 and 281-291; "The Prediction Theory of Truth," *Monist*, vol. XXXVIII (1928), pp. 386-401; and "Neo-Pragmatism and the Ways of Knowing," *Monist*, vol. XXXVIII, pp. 494-510.

² Professor Morris says: "In one stroke the pragmatist has transcended the positions of the objectivist, the dualist, and the subjectivist." *Monist*, vol. XXXVIII, p. 505.

³ Pagings given hereafter directly in the text, unless indicated otherwise, refer to the second article in *The Monist*, viz. "Neo-Pragmatism and the Ways of Knowing," vol. XXXVIII.

whatever else knowledge may or may not be it is intra-experiential. And "in experience," we are told, "we are directly immersed in at least one level of reality." But "such immersion is not as such knowledge" (p. 505). What, then, is knowledge? Professor Morris answers: "An experience⁴ is revelatory of something beyond itself only at the stage of symbolic functioning, and it is only at this level that knowledge occurs. Knowledge is a function of and a product of the reflective process" (pp. 505-506). "The minded organism," he goes on to say, "is endeavoring to 'know' the stimulus⁵ by relating it to more familiar and previously known experiences, and knowledge arises when the intellectual claims or predictions as to the relations and properties of that which is being known are substantiated by occurring as predicted. An experienced item is known when by the functioning of symbols it is correctly related to other experiences, and the symbol sequence which so relates the experience in question is a case of knowledge. . . . The greater the number of verified predictions about a thing⁶ and its connections with other things,⁶ the more we know that thing.⁶ . . . Knowledge, then, is the residuum of successful judging processes, and so issues from, and only from, the symbolic functioning of events, that is, from the reflective process" (pp. 506-507). And again: "Wherever there is knowledge there is the interpretation of an ambiguous stimulus in terms of familiar associated experiences. . . Knowledge means that a problem has been solved. . ." (p. 509).⁷ And finally: "With experience conceived as a natural event, the organism is immersed in reality, but to know the world reflection made possible by symbols is necessary, and it is only when predictions made by symbols are verified by obtaining the experiences predicted that knowledge. . . . emerges" (pp. 509-510).

It will have to be admitted that all of this sounds not only very interesting but also—on the whole—fairly reasonable (though one must not let himself be deceived by the sound of it). Moreover, while definitely claiming to have "transcended the positions of the objectivist, the dualist, and the subjectivist" it still seems to account

⁴ Does an *experience* mean a particular episode, occurrence, or detail within *experience-überhaupt*?

⁵ Does Professor Morris mean the *stimulus* or the *stimulating object*?

⁶ Is it the *thing* or the *stimulus* caused by the thing which is meant here?

⁷ Yes, but before the problem *has* been solved, that is to say in the *getting* of knowledge, is it not necessary to acknowledge a non-experiential substance or object which is involved in the *getting*?

for the element of transcendency in the knowing process and at the same time assures us to have real contact with reality. It further insists upon placing the entire knowledge situation squarely *within* the realm of actual human experience. Whether neo-pragmatism can really do all of these things and still remain consistent with itself—this is another question.

Supposing one were to admit that "experience is not a revelation or appearance of some metaphysically distinct or different reality" (p. 496), that would hardly be identical with saying, or even justify the conclusion, that therefore the metaphysical reality is itself the experience. The fact is, Professor Morris admits this later on, when (on page 509) he states that "the difficult problem of the relation of experience to reality remains," a statement which he seems to forget in most of his argument. But, even aside from this, the above supposed admission can hardly be made. For everything that is revealed in experience is tinged with the fact that it *is experienced*. Nothing given in experience is independent of the experience in which it is given. There is no such thing as direct grasp of any external real as it is without reference to the experienter. Nor is it true that "to have an experience is just to have it, and not to know anything about it" (p. 505). For, as Professor George P. Adams has clearly shown in his presidential address of 1927 on "Immediacy and Meaning,"⁸ every experience which is even enough of an experience to be apprehended as having been 'had' is, after all, by virtue of that apprehension already something more than the merely 'had experience.' It has a meaningful content and that—so far forth—is a type of knowledge. A merely 'had experience' without such meaning or without being apprehended would not even be recognized as having been had, *i.e.* it would be an unconscious experience and consequently would not be 'experienced' in any *meaningful* sense of this term at all. To be empty of meaning certainly equals meaningless.

Besides, Professor Morris grants that in the knowledge situation at least "an experience *is* revelatory of something beyond itself." For, while he insists that "in experience we are directly immersed in at last one level of reality" (which, however, is by no means equivalent to saying that experience is immersed in reality-as-such, and much less that experience and reality are identical, an argument

⁸ Cf. this paper in *The Philosophical Review*, vol. XXXVII, No. 2 (March, 1928), pp. 109-132.

which I have already brought out, but which can stand repeated emphasis), he is equally emphatic in saying that "such immersion is not as such knowledge." Knowledge, we are told, occurs only at the level of symbolic functioning; in other words, it is said to consist of "the relation of symbolic to non-symbolic events." Thus, while refusing to admit the transcendental character of all human experience, Professor Morris seems to be perfectly clear in granting the transcendental character of *knowledge*.

On the other hand it is next to impossible to see anything but subjectivism pure and simple in such statements as the following: "The minded organism is endeavoring to 'know' the stimulus by relating it to more familiar and previously known experiences, and knowledge arises when the *intellectual*⁹ claims or predictions as to the relations and properties of that which is being known are substantiated by occurring as predicted. An experienced item is known when by the functioning of symbols it is correctly related to other experiences, and the symbol sequence which so relates the experience in question is a case of knowledge." Just how subjective the first of these two sentences is may be seen even more clearly by adding a few words (in italics) which—to the present writer at least—would not only seem to be quite in harmony with Professor Morris' position and argument, but which would even seem to state that position in this connection more precisely. Viz. "The minded organism is endeavoring to 'know' the stimulus by relating it to more familiar and previously known experiences, and knowledge arises when the intellectual claims or predictions as to the relations and properties of that which is being known *in experience without reference to anything which might be transcendental to experience* are substantiated by occurring *in experience again* as predicted."¹⁰ It is true, one of the sentences which follows very close upon the heels of the one just quoted in Professor Morris' paper contends that "the greater the number of verified predictions about a *thing* and its connections with other *things*, the more we know that *thing*" (p. 507).¹¹ This reference to '*things*' seems again to be a fairly clear case of going beyond predictions, intellectual claims, and even beyond

⁹ Italics not used in the original.

¹⁰ All italicized words in this sentence are added by the present writer, though the sentence otherwise is a quotation from Prof. Morris' article in *The Monist* (1928), p. 506.

¹¹ Italics not used in the original.

stimuli to the things themselves, transcendental to all these claims and predictions. But even here it must not be forgotten that, according to the argument of the paper (at least if the present writer understands the main purport of it at all correctly), these 'things' are just as much *within* the realm of experience as are predictions, symbols, the reflective process, and stimuli. And this in spite of the fact that to the knowledge-experience at least Professor Morris had previously granted a transcendent character (as we have already pointed out above). In other words, despite guarding himself at one or two points against a subjectivistic explanation of knowledge, Professor Morris nevertheless finally falls headlong into this very position. This fact becomes even more apparent in the sentence with which he closes this particular section of his argument and which follows directly upon the heels of the one quoted last, viz. "Knowledge, then, is the residuum of successful judging processes, and so issues from, and only from, the symbolic functioning of events, that is, from the reflective process" (p. 507). A more complete surrender to subjectivism in the theory of knowledge can hardly be expected than this statement offers.

On page 509 Professor Morris goes on to say that "wherever there is knowledge there is the interpretation of an ambiguous stimulus in terms of familiar associated experiences." Now it is obvious that when a "stimulus" is "ambiguous" it needs to be made unambiguous. And this involves some sort of procedures. Now the question is: upon what are these procedures directed? Are they directed upon the "stimulus," or upon the "experience," or upon the thing *arousing* the stimulus? In other words, when procedures are adopted, looking toward the clarification of the meaning of the stimulus, what is the *intentional* character of the procedure? Does it intend *thing*, or does it intend *stimulus*? Furthermore, "interpretation of an ambiguous stimulus" is a reflective (and therefore quite subjective) process and is not identical with successful apprehension of the external thing itself. The external thing itself is *one* of the causes of the "ambiguous stimulus" (the receptive sensory apparatus of man being the other), but 'thing' and the 'stimuli' are *not identical*. And even if they were, the "interpretation" of it "in terms of familiar associated experiences" already vitiates the possibility of knowing that thing as it is in itself, by having its knowledge determined not purely by the nature of the thing itself, but by the

stimulus-as-interpreted-in-terms-of-familiar-associated-experiences. Thus knowledge *is* relative to the observer (as indeed Morris himself admits on page 505). We may go on with Morris and admit this knowledge as *certain*, but it is certain *only* because its certainty depends on the coherence of the system of the observer's experiences (for even the elements of successful or verified prediction are in this realm). In other words, the certainty is after all *subjective* certainty and not the certainty of objective comprehension or grasp.

One further difficulty in Morris' attempt to get out of his subjectivism needs to be pointed out. If, in his statement that on the level of symbolic functioning, which is the only level on which knowledge is said to occur, "experience is revelatory of something beyond itself," Professor Morris admits the transcendent character of knowledge, it is only fair to ask: what is that 'something beyond?' There does not seem to be any way of answering this question, especially not since the general argument seems to contend for the all-inclusive character of experience and for the impossibility of telling what anything beyond experience might be—if there were any such thing, since obviously we can know only what in some form or other comes within the realm of our experience.

Nor is it clear—on the basis of the general argument of the article—how knowledge (and truth, for the two are said to have identical logical status) could be said to be found "in the relation of symbolic to non-symbolic events" (p. 506). For knowledge, it has been asserted most emphatically, "occurs only at the stage of symbolic functioning." And the problem is *precisely how* to relate non-symbolic events to symbolic ones; or, how symbols can adequately represent facts and things which are themselves *not symbolic*. Nor is this problem solved by saying that, after all, both symbols and things are experiential (events within experience), for it is not experience which is to be related but symbols and things, and, unless either symbols *are* things or things *are* symbols, to say that both are aspects or events of and within experience does not yet explain or even describe the relation of these two experimental events to each other.

Another difficulty is found in Professor Morris' attempt to identify knowledge and truth. "Knowledge," he says, "is the residuum of successful judging processes" (p. 507).¹² "Since every truth is

¹² Italics not used in the original.

a case of knowledge, the logical status of the two is identical" (pp. 507-508). To 'know,' for Morris, is therefore identical with knowing correctly. False interpretation he does not seem to admit as 'knowledge.' What, then, is it? What is error, if not a case of knowledge, even though of incorrect knowledge? Certainly a theory of knowledge must be able to account for error in some fashion or other.

If, on the basis of the general argument of the articles, one ask again, what, precisely, does Professor Morris mean by knowledge, the best one would seem to be able to get as an answer would be somewhat as follows: *knowledge is the assimilation in experience of non-symbolic (transcendent?) events through the reflective processes of symbolic functioning.*

But such a statement contains at least two outstanding difficulties. First of all, where, since it has previously been asserted that *only* at the stage of symbolic functioning does experience reveal any transcendent factors or events, do the non-symbolic (transcendent) events come from, which are to be assimilated? Is there any answer to this question? Or, rather, *can* there be any answer to it in the light of the argument of Professor Morris' articles?

And, in the *second* place, there seems to be no way whatever of telling what that "something beyond" (i.e. the transcendent factor or event) is, except that—although in itself "*non-symbolic*"—it is assimilated through the reflective processes of *symbolic* functioning to the total experience of the knower. And this, so far from being an answer to the second question, only seems to increase the difficulties of the problem.

Moreover, if "it is only when predictions made by symbols are verified by obtaining the experiences predicted that knowledge occurs" (p. 510), then the whole knowledge situation shows itself again as purely *subjective*. For predictions are made by the subject; symbols are substitutes used by and having meaning for the subject; and the "predicted experiences obtained" as experiences are again the experiences of the subject—despite the attempt to take 'experience' as an all-inclusive whole. Consequently, despite Morris' assertions to the contrary, there does not seem to be any *really* transcendent element in the knowledge as described and defined by him. No wonder that he thinks he has solved the knowledge-problem: for it is easy to do so when one just quietly brushes

aside the one aspect of this problem which has always been the most difficult, namely that of the question of transcendence. But above all it is certainly not quite fair, after having simply brushed the difficulty aside without even having recognized it much less tried to solve it, to claim to have reached a non-subjective solution of this problem.

It will have to be admitted that there seem to be evidences in Professor Morris' articles which would indicate that he tried to get out of these various difficulties by the widening of the concept of 'experience' so as to make this concept all-inclusive.¹³ At any rate 'experience' used in this broad connotation plays a commanding rôle in the development of his theory. Professor Morris seems to feel that, having taken experience as a natural event occurring in the natural life of an organism immersed in reality, the question of the poles of subject and object—the problem which has been the bugbear of epistemology through the centuries—has just naturally been resolved in this medium of 'experience.' Knowledge occurs, then, whenever it is possible to obtain within experience the results which had been predicted (through the reflective process of symbolic functioning) in experience. All of this may sound quite simple. But is it really so simple? If 'experience' has become so enlarged as to be inclusive not only of the subject and the action, behavior, and thought of the subject, but also of the external stimuli which arouse the subject, and even of the objects in the external world which are the real basis for these external stimuli—then, I fear, 'experience' has become so broad in its signification as to be practically meaningless; it might then be simply set to equal the universe,¹⁴ at least to equal the universe-as-capable-of-being-known. But to do so gives us only a sham-solution of the epistemological problem. That is to say, such a position would seem to solve the knowledge-problem *theoretically* by bringing subject, object, and stimulus all within the one realm and medium of experience, within which single realm knowledge is simply one way of behavior, namely that of the symbolic functioning of the processes of reflection. But in the *actual* experience of man the duality (or, perhaps, better, the trinity) of the knowledge relation still exists; for here the knowing person still

¹³ A use of the term which, of course, is quite familiar in philosophical circles since Dewey's *Experience and Nature*.

¹⁴ The whole concept is, in fact, strangely reminiscent of the somewhat out-of-date and discredited Absolute of objective idealism.

finds himself confronting (or confronted by) an object which is not himself (plus his apprehension of that object which is neither he himself nor the object in the external world).

However, it is not even quite evident from Professor Morris' arguments that he means by 'experience' the just described all-inclusive medium. There seem to be at least some evidences in his argument that in the *particular experience* of 'knowing' at any rate there is a transcendent element: man's reflective process by the use of symbolic functioning reaching out beyond the actual experience to something which is *not* the symbol (but for which the symbol is a substitute) nor the experiencing and reflecting subject but transcendent to both: i.e. facts or things in the real world outside of the subject—but for that reason by no means beyond the possibility of coming within the realm of my experience through my capacity to experience the real world in the reflective process of symbolic functioning.

If this comes closer to Professor Morris' actual meaning, then the problem remains: How can we say that in experiencing the real (subject-transcending though *not* experience-transcending) world by the reflective process of symbolic functioning we are actually experiencing the *real world*? Does this not simply amount to the dogmatic assertion that, since this reflective process of symbolic functioning seems to be the only way in which the human mind can apprehend the real world, such apprehension is not only direct but *knowing* (that is to say, *successful* knowing) contact with reality as it really is? Nor is this difficulty overcome by saying that in so far as such apprehension is valid knowledge it is that by virtue of the fact that results have been obtained as predicted by the reflective process of symbolic functioning. For these results are either again in the form of symbols—in which case there would seem to be no way of comparing either the symbolic prediction or the symbolic results with the actual facts in the world which transcends these symbols; in other words, we would be fairly shut up within our own mental (reflective) processes of symbolic functioning. Or else the results *are* in the external world and in that case—on the basis of the whole previous argument of Professor Morris—we can only have *knowledge* of them through the reflective process of symbolic functioning; in which case we are precisely again where we were before: namely we have no way of comparing the actual results in

the external world with the results within our reflective processes of symbolic functioning.

So we are finally forced to say that Professor Morris in his neo-pragmatic theory of knowledge, so far from having provided a solution of the epistemological problem which "transcends the positions of the objectivist, the dualist, and the subjectivist," has precisely fallen into the trap of a thorough-going subjectivism, in which his prediction and result-obtained theory is not much more or less than the old coherence theory of truth of the idealists.¹⁵ Such, at any rate, seems to be the import of such a statement as "Wherever there is knowledge there is the interpretation of an ambiguous stimulus *in terms of familiar associated experiences*" (p. 509).¹⁶

It is, of course, possible, that I did not quite comprehend the position of Professor Morris. But if this should be the case, I think that, in all fairness to the rest of the philosophical world, he owes a statement of his position which shall be sufficiently clear, precise, and unambiguous so that it will enable the reader to know just exactly what he does mean. In the meantime we would seem to be obliged, by the force of his own argument, to classify his theory of knowledge as unequivocally subjective.

If, in this discussion, I have concerned myself more particularly with Professor Morris' position than with neo-pragmatism as a general movement this was done because, in the first place, it seemed best to point out the weaknesses of the position by actual and fairly recent quotations from one of the leading exponents of the theory, lest the critic be accused again that he is not "precise in the statement of the doctrine" which he is criticising; and, secondly, because Professor Morris himself avers that he wrote his articles in order to provide us with a "precise formulation of the pragmatic account of knowledge,"¹⁷ and one ought to criticize the precise formulations rather than those which may be more vague or tentative.

¹⁵ Cf. on this point the present writer's paper on "Aspects of Permanent Value in the Coherence View of Truth," *The Personalist*, vol. X, No. 3 (July, 1929), pp. 168-177, especially pp. 169-172.

¹⁶ Italics not used in the original.

¹⁷ Cf. page 495 of the second *Monist* article.

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A REPLY TO PROFESSOR SCHILPP

I AM grateful to Professor Schilpp for the time he has taken with my articles, even though he has concentrated his attention upon such a small part of them. Nevertheless, to be brutally frank, his own article carries no conviction with me whatever, and has called out no change of heart. The article on knowledge (*The Monist*, vol. XXXVIII, pp. 494-510), which furnishes his main basis of argument, was aimed at showing the inadequacy of Professor Montague's book, which neglected to give serious attention to the critical aspects of the instrumentalist position, rather than at giving a detailed presentation of the instrumentalist view. Indeed, I spent barely three pages on this presentation, assuming that Dewey, rather than myself, had made a real contribution here. If Professor Schilpp wants to cross swords with a really "leading exponent" of such a view, let him deal with Dewey's *The Quest for Certainty*, or with Lewis' recent *Mind and the World-Order*, in which Lewis calls his view "conceptualistic pragmatism," a title which connotes very much what I intended by the term "neo-pragmatism." By such references I do not, of course, wish to apologize for my own words, or to transfer to any one else the responsibility for them.

Leaving aside the numerous minor points which might call for discussion, the main intention of Professor Schilpp's article is to damn me with the epithet "subjectivism." His argument seems to be somewhat as follows: since the symbols and predictions are those of a subject, and since the experiences completing the prediction are those "of the subject," knowledge does not transcend the subjective experiences of a subject. I take it that the criticism is not merely that on the symbolic view knowledge is relative to a subject, but that it does not get beyond the subject. The "weaker" claim seems to me to be true, and the "stronger" claim to be false and not an

implication of the theory in question. It may be noted that Professor Schilpp would seem to deny both claims, because in spite of certain confusing statements, he is obviously anxious for knowledge to grasp the "real-as-such," which for him transcends experience, and to be determined "purely by the nature of the thing itself," and not at all by the subject. Does he mean that knowledge is not relative to a subject or that what is known is not so relative?

If Professor Schilpp were to claim that the view I have given is an experimental account of knowledge, and that on this view there would be no knowledge without reflective processes, this would be merely reporting what I said. But he intends "subjectivism" to have other connotations, such as the suggestion that knowledge is somehow only an affair of the subject and not a transaction with anything beyond the states of the subject.

The decisive question becomes the conception of the relation of experience to "reality." Professor Schilpp apparently regards experience as intrinsically mental and as a state of a subject. I do not. He seems to have forgotten my claim (*op. cit.*, p. 504) that the symbolic approach to knowledge was untouched by the question as to whether experience is selected or generated by the presence of the organism, or as I may now say, by the presence of a subject. Merely to say that knowing involves reflection, and that the thing known is some factor of experience, does not involve the denial of the view that the thing known is some aspect of "reality" which has entered into experience and which may suffer no change by this new relation. Indeed, if the subject is itself stated in terms of experience, and such a statement is an ideal of a radical empiricism, it is difficult to see what could be meant by calling experience in general "subjective." In other words, nothing that I have said in any article is incompatible with a neo-realistic metaphysics, while the addition of the symbolic theory of knowledge would free neo-realism from its embarrassment with the problem of error.

However, even if experience is dependent upon a subject, Professor Schilpp's argument is still inadequate. He has forgotten another statement in the article he has so freely quoted: "It would seem that merely recognizing the relation of content to a subject does not make such content subjective, in the sense of making it a mental state of a subject-mind." (*op. cit.*, p. 499). Experience may quite well be relative to other factors, even while it is relative to a

subject, or to a subject-mind. If fact, if experience be taken as a natural event, the subject may at best be only one of the conditions under which the event takes place, and such a view hardly implies the "all-inclusive experience" with which Professor Schilpp attempts to frighten me.

My conclusion is that while knowledge is an occurrence in the biography of a subject (however the subject be interpreted), what is known need not be mental, or be constituted by the subject, though such occurrences can also be known. Even in those cases where the subject is *one* of the conditions under which the object that is known takes place, this object is as "objective" as "subjective," and knowledge is still not properly classed, without qualification, as "subjective."

While metaphysics is not knowledge, but opinion, the view of knowledge which I have stated is compatible with any metaphysics, and is certainly not tied down to subjectivism. Indeed, for my part, its affiliations are with a modified form of neo-realism and objective relativism. In pointing out that the subject is one variable in the knowledge relation, a theory is certainly not committed to subjectivism in the case of the object known.

As James would say, as far as I can see, Professor Schilpp's article leaves my "withers unwrung." Perhaps his difficulties will lead him to develop some view of the nature of the subject and the meaning of the term subjectivism, and this would be all to the good. In social theory we are learning not to condemn an advocated change by the application of the emotive epithet "socialism," and it is high time that philosophers should not pretend to still an argument by fastening on it the emotive and highly ambiguous appellation of "subjectivism."

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SOME RECENT BOOKS

Marx and Lenin: The Science of Revolution. By Max Eastman. New York, Albert and Charles Boni, 1927. Pp. 263. \$2.00.

The gist of this book seems accurately put in the following summary carried on its jacket: "Part I. Orthodox Marxism asserts that the material world is inevitably evolving, through class struggle, to a dictatorship of the proletariat which will usher in the communist society. Ideas in the minds of socialists and communists are a "reflection" of this inevitable process. In other words, Marxists attribute their own purpose to an external Reality, and conceive themselves as co-operating with that Reality. This is a religious, or animistic way of thinking—no matter whether you call that Reality matter or spirit. Part II. Marxism must be restated in the form of a scientific hypothesis, as follows: By organizing the class struggle and carrying it forward to a dictatorship of the proletariat, it will be possible to usher in a communist society."

Simple as is the change demanded by Eastman, he regards it as most far-reaching in its consequences in that it alone removes the last vestiges of an illusionary Utopianism and puts the Marxist in proper relations with modern science, creative art and moral education. To quote the closing words of his book: "It presents the revolution as a purpose rather than a belief, and the Marxist as a scientific engineer of revolution."

Numerous notes and bibliographical references enrich an essay characterized by a simple yet important thesis and by a lucid and earnest style.

Possibility. By SCOTT BUCHANAN. New York, Harcourt Brace & Co., 1927. Pp. 198. \$3.50.

This essay represents the search for "a general methodology, not merely for this or that discipline, but rather an organon of intellectual imagination." It seeks an intellectual way of life, which, while perhaps not leading to future discovery or invention, may bring peace of mind in the midst of the present confusion of doctrines. Absolute possibility, the sort written about by philosophers and theologians, is distinguished from imaginative possibility, as exhibited in the fine arts and literature, and from scientific possibility. The first of these is discussed in reference to the philosophies of Kant and of Aristotle, "where possibility has played a deciding rôle;" its use is staunchly defended against the charge of vicious teleology. The metaphysical outlook of the book regards experience as "like visible light. As a whole it is the source of light; its parts are visible objects in all their concrete richness; ideas are reflecting mirrors and refracting prisms affording antiphonal understandings which are focused in immediate intuitions."

The Philosophy of John Dewey. By Joseph Ratner. New York, Henry Holt and Company, 1928. Pp. XII + 560.

The purpose of this volume "is to help make Mr. John Dewey's philosophy accessible to the lay reader," in particular, "to assist him to understand Mr. Dewey's basic philosophical principles, not only in themselves, but in their manifold relations to the rest of his work." To this end, "it was necessary to arrange the selections in the order demanded by the logical development of ideas and in the natural relationships of the various branches of philosophy to one another." Accordingly, Mr. Dewey's philosophic method, metaphysics and logic come first, and only afterwards are presented his doctrines on psychology and ethics, education and politics, art and religion.

Mr. Ratner has neither supplied annotations nor attempted interpretation; he has limited himself strictly to the task of selection and arrangement, with only "slight verbal changes in the original text so that the transmission from one selection to another may be natural and smooth." The selections seem to be wisely made and the book, besides fulfilling its main purpose, should be valuable as a text in courses on the philosophy of Dewey or of contemporary life.

THE MONIST

THE UNITARY FIELD THEORY OF EINSTEIN AND ITS BEARING ON THE MACROSCOPIC ATOMIC THEORY*

WHEN Einstein, in the general theory of relativity, extended the principle of relativity so that it applied to non-Galileian as well as Galileian frames of reference and, thereby, established the fact that the metrical properties of molar space-time are conditioned, in part at least, by the gravitational field, several problems remained unsolved. Firstly, there was the question of the relation between the electro-magnetic and the gravitational field. Secondly, an adequate theory of measuring seemed to be lacking. Thirdly, the question of the relation between matter and space-time arose. And lastly, a problem of motion appeared.

The first problem was quite evident. The general theory necessitated the conclusion that the metrical properties of space are conditioned by the distribution of molar matter. This meant that the gravitational field and space had been brought within a single continuum. In fact, Einstein asserted that "gravitation occupies an exceptional position with regard to other forces, particularly the electro-magnetic forces, since the ten functions representing the gravitational field at the same time determine the metrical

*Cf. "The Macroscopic Atomic Theory; A Physical Interpretation of the Theory of Relativity," *J. of Phil.*, XXV, pp. 449-467; also *Proc. National Academy of Science*, XVI, pp. 55-68.

properties of the space measured."¹ This left nature with a sharp gulf between the metrical-gravitational field and the electro-magnetic field. The artificiality of this situation was evident. Gravitational fields appear in the same regions through which electro-magnetic forces are transmitted, and are known to be associated with molar bodies which are built up, in part at least, out of the electrons and protons of electro-magnetic theory. Here was a dualism which empirical knowledge, as well as the desire for logical simplicity, urged the mind of man to remove.

The first person to develop a theory which provided this unification was Weyl.² In his theory the unique position, with reference to the determination of the metrical properties of space, which Einstein had assigned to the gravitational field, disappeared. Weyl's theory was generalized by Eddington to establish an interpretation of science which involved the reduction of all the physical categories of science, so far as relativity theory is concerned, to geometrical ones.³ A few years later, Einstein rejected this development of his theory. He said, "Through many failures, I have arrived at the conclusion that one cannot come to the truth in this way."⁴ His latest achievement⁵ represents the positive part of this statement. It is the result of an attempt to achieve what Weyl realized, by different methods. The structure of the spatial, the gravitational, and the electro-magnetic field is revealed as a single structure of a single continuum.

Two points may be noted with reference to this aspect

¹ Translated from "Die Grundlage der allgemeinen Relativitätstheorie," *Annalen der Physik*, 49 (1916). *The Principle of Relativity*, Methuen, (1923), p. 120.

² Cf. "Gravitation und Elektrizität," *Sitzungsberichte der Preussischen Akad. d. Wissenschaften*, 1918.

³ Cf. A. S. Eddington, *Space, Time and Gravitation*, Cambridge, 1921, p. 197.

⁴ *Math. Annalen*, 97, p. 99ff

⁵ "Zur einheitlichen Feldtheorie," *Sitzb. d. Preuss. Acad. d. Wiss.*, Jan. 1929.

of the unitary field theory of Einstein. Firstly, it involves a rejection of his original thesis that gravitational fields alone determine the metrical structure of space. Secondly, unless it has greater fertility in providing secondary laws and consequences in the field of experimentation, there is no reason for preferring Einstein's solution to the one previously given by Weyl. Both accomplish the same purpose by providing science with a tensor equation in which the electro-magnetic as well as the gravitational potentials are contained.

It is when one considers Einstein's latest achievement in its relation to the second problem to which the general theory gave rise that its uniqueness and significance appears. This problem arose because it seemed difficult to provide an adequate basis for measuring if the geometry of the general theory were accepted. The first person to fully appreciate the reality and seriousness of this difficulty was Whitehead.⁶ He pointed out that if space has the variable and heterogeneous structure which the general theory necessitates, then it is very difficult to understand how the measurements of distant spaces, which provide the basis for modern science, could ever have occurred.

An appreciation of the validity of this rather devastating comment calls for a consideration of what measuring requires, and what the geometry of the general theory provides, in the way of metrical properties.

Consider a local distance here on the earth. A determination of its length presents no problem. One takes a standard rod and notes how many times it must be layed down end to end in passing through the distance in question. In determining a distance in astronomical space, the task, however, is not so simple. It is impossible for the

⁶ Cf. *The Principles of Natural Knowledge*, Cambridge, 1919, pp. 54 ff.; *The Concept of Nature*, Cambridge, 1920, Ch. VI.; *The Principle of Relativity*, Cambridge, 1922, Ch. III.

scientist to travel with his measuring rod from the earth to the sun, and then go cruising out through space to Sirius moving his measuring rod along as he goes. Instead, certain equalities must be established between the astronomical distances which cannot be traversed, and the local terrestrial distances which can be so traversed. The establishment of these equalities necessitates a recourse to universal geometrical principles. Such universal geometrical principles cannot be safe guides for the establishment of a relationship of congruence between celestial and terrestrial distances unless they exist in nature in the form of a certain amount of uniformity and constancy in the metrical properties of space. Furthermore, these uniform metrical properties must extend over very great distances. In other words, it is only by combining universal geometrical principles, which presuppose a certain constant uniformity in the metrical properties of space, with the values for local distances, that we can talk with verifiable meaning about astronomical distances at all.

Nevertheless, the general theory of relativity left science with a theory of space in which no such basis for uniformity could be expected to exist. This becomes clear if one remembers that the general theory contains two parts: firstly, a single law of motion, which asserts that a body follows a path which is a geodesic in four-dimensional Riemannian space-time; and secondly, the tensor equation for gravitation which specifies how the distribution of gravitational potentials, or in other words, the distribution of matter, determines the metrical structure of space, and hence, the lay of the geodesic of a given body in a given region. The geodetic principle states the law of motion in geometrical terms; the tensor equation, however, immediately reduces the geometry to physics, by making the geodesic for a given region, and hence, the

metrical properties of space for that region, dependent upon the distribution of matter. This means, when matter rearranges itself, that space must take on different metrical properties. Since there is nothing in traditional physical theory to warrant the conclusion that matter must preserve a certain uniform and constant relatedness during all its motion, it becomes evident that the general theory, in the form in which it came originally from Einstein, leaves us with a universe in which the measurement of astronomical distances should be impossible. In other words, it leaves us with a universe in which the mechanics of Newton and Einstein could never have come into existence.

Is it any wonder that Whitehead wrote as follows: "I cannot understand what meaning can be assigned to the distance of the sun from Sirius if the very nature of space depends upon casual intervening objects which we know nothing about. Unless we start with some knowledge of a systematically related structure of space-time we are dependent upon the contingent relations of bodies which we have not examined and cannot prejudge."⁷

This point can be stated in geometrical terms. The measurement of astronomical distances requires the establishment of equalities between astronomical and terrestrial distances. As we have indicated, these equalities can be established only by an appeal to geometrical principles. These principles must provide, among other things, a meaning for distant parallelism. The geometry of the general theory of Einstein provides a meaning for parallel displacement only over infinitely short distances. The same is true of the generalizations of Weyl⁸ and Eddington.⁹ This follows because the only type of parallelism which it pro-

⁷ *The Principle of Relativity*, Cambridge, 1922, pp. 58-59.

⁸ Cf. *The Principle of Relativity—Einstein and Others*, Methuen, 1923. p. 203.

⁹ Cf. *The Mathematical Theory of Relativity*, Second Ed., Cambridge, 1924, p. 213.

vided is Euclidean; and space takes on Euclidean properties in a Riemannian geometry only at a point, or, in other words, only over regions of infinitely short extension.

The significance of this can be made explicit by referring to certain recent statements of Einstein. In speaking of the Riemannian geometry of the general theory he writes: "Now consider two neighboring points PQ on the (Riemannian) surface and a little way off another pair of points $P'Q'$. What does it mean to say that the distance PQ is equal to the distance $P'Q'$? This statement only has a clear meaning when we have a small measuring rod which we can take from one pair of points to the other and if the result of the comparison is independent of the particular measuring rod selected.¹⁰ It is evident, however, that we cannot take a measuring rod from a tract here on the earth to the tract which joins the sun to Sirius. If this is the end of one's theory of measurement then the determination of astronomical distances should be an impossibility.

Another statement by Einstein made in the same paper is relevant. It reads: "Consider a two dimensional Riemannian space in the form of a hen's egg. . . . it has a perfectly definite meaning to speak of the distance of two neighboring points PQ on the surface. Similarly, it has, of course, a meaning to say of two such pairs of points (PQ) ($P'Q'$), at separate parts of the egg, that the distance PQ is equal to the distance $P'Q'$. On the other hand, it is impossible now to compare the direction PQ and the direction $P'Q'$. In particular it is meaningless to demand that $P'Q'$ shall be chosen parallel to PQ ."¹⁰ It is to be emphasized, however, that it is permissible to talk, even about the equality of the two lengths in question, in terms of determinable values, only in those cases in which a

¹⁰ Albert Einstein, "A Simplified Discussion of 'Field Theories, Old and New,'" N. Y. Times, Feb. 3, 1929.

scientist is able to apply a measuring rod directly to both of them. If PQ is a terrestrial distance and $P'Q'$ a celestial one, this is impossible. The latter astronomical type of distance can only be measured by establishing a relationship of equality between it and a terrestrial distance, by use of geometrical principles which involve, directly or indirectly, the notion of distant parallelism. Since the geometry of the general theory provided no meaning for distant parallelism, it follows that it left science with a theory of nature in which measuring is an impossibility and its own existence an absurdity.

The first attempt at a solution of this difficulty was offered by Whitehead.¹¹ He concluded that the doctrine of the heterogeneous character of space, of the general theory, left the physical theory of nature without an adequate account of the uniformity presupposed in measuring; and argued that it necessitates the rearing of science upon new philosophical foundations. He turned, therefore, to a re-examination of immediate experience in order to determine the original basis of our scientific conceptions. The result of this analysis, when supplemented by the deliverance of the Michelson-Morley experiment, was a conception of nature in terms of a vast extensive enduring process which he termed an "event." It is by abstractions from this monistic extensive occurrence that all our scientific concepts are derived. The first and most fundamental abstraction consists in the assignment of different parts of this total event to different classes by means of the relation of simultaneity. The relativity of time-systems arises from the Michelson-Morley experiment, and the fact that the passage of nature is too complex to insure that this assignment must be made by all observers in the same way.

In each time-system the complex of events exhibits two

¹¹ Cf. *The Concept of Nature*, Cambridge, 1920, Ch. III ff.

main attributes: firstly, a certain constant uniform structure, termed space, joining the parts, or smaller events, together; and secondly, many adjectival permanences, such as the objects of sense, which produce the content that appears within this structure. Since there is a meaning for space only in a given time-system, a basis is provided for the relativity of space; and since the structure of space in a given time-system is constant, and is independent of the adjectival permanences which make up what we call molar matter, it follows that the uniformity and constancy necessary for measuring, exists, notwithstanding the changing relations of objects. This enabled him to write that "If" the metrical structure of space "be a relatedness between events, it has the character of a systematic uniform relatedness between events which is independent of the contingent adjectives of events."¹² Thus a theory is attained in which the relativity of space and time can be accepted without unsolving the problem of measuring.

It is to be noted, however, that Whitehead's solution comes at a terrific cost. It is necessary for him to deny the validity of Einstein's general theory.¹² This follows because the independence of matter from space-time structure, which his theory entails, necessitates the rejection of the thesis that the metrical properties of space are conditioned by matter. To deny this is to reject the Einsteinian law for motion and Einstein's tensor equation of gravitation. The reason for this decision, however, can be appreciated. Whitehead preferred an adequate theory of measuring to a law for gravitation which left science with a theory of space that made the measurement of astronomical distances impossible.

It seemed evident to the writer, however, that Whitehead's solution was not entirely satisfactory, notwith-

¹² *The Principle of Relativity*, Cambridge, 1922, p. 58.

standing the validity of his criticism, and the inadequacy in the geometry of Einstein's general theory, which gave rise to it. Although it provided a basis for measuring and a meaning for motion in a given time-system, the rejection of the dependence of space-time upon matter, which the general theory established, did not seem to be justified. Firstly, the extension of the principle of relativity to non-Galileian frames of reference seems to be a natural, if not a positively necessary, consequence of the special theory. Secondly, the experimental evidence for the general theory has been questioned less than the experimental evidence for the special theory upon which Whitehead's interpretation rests. It is to be noted that it is difficult to get the principle of the relativity of time-systems from a philosophical analysis of the extensive characteristics of nature. It is necessary to appeal to the Michelson-Morley experiment to establish this fundamental principle in Whitehead's theory.¹³ It seems to be an unwarranted choice, therefore, to insist upon adjusting one's theory to experimental evidence in the case of the special theory, and to refuse to do so in connection with the general theory. The facts seem to indicate that the metrical properties of space-time are conditioned by the distribution of matter, as the experimental evidence for the general theory indicates, and that the uniformity necessary for measuring, for which Whitehead argues, also exists.

Is there any reason why this should not be the case? In other words, is it necessary to choose between Einstein's doctrine that matter conditions the metrical structure of space-time, and Whitehead's doctrine that the measuring of science presupposes the existence of uniform metrical properties over great finite distances in space?

In 1928 the writer pointed out¹⁴ that these two theses

¹³ Cf. *The Concept of Nature*, Cambridge, 1920, p. 85.

¹⁴ Cf. *The Journal of Philosophy*, XXV, pp. 459, 464, 465.

are incompatible only if one assumes the traditional theory of matter, and that the logical conclusion to draw, when one finds uniform constant metrical properties to be necessary for measuring, and yet dependent upon the distribution of matter, is that matter has a greater capacity to produce uniform relatedness than our traditional theory of matter would suggest.

From this, two consequences follow. Firstly, our traditional theory must be amended so as to provide us with a set of physical entities which can give rise to the general uniformity which is at the basis of astronomical measuring while also permitting the variable potential distribution which the general theory requires. Secondly, an analysis of the theory of relativity, which traces it back step by step, through its concrete connections with nature, to the principles at the basis of natural phenomena which it implies, should indicate what this new theory of matter is. This analysis was carried out with positive results, and published in August, 1928, in a paper¹⁵ entitled "The Macroscopic Atomic Theory: A Physical Interpretation of the Theory of Relativity."

This analysis led to the conclusion that nature is atomic in character, and that the discontinuity which motion and atomism involve, as well as the uniformity which measuring requires, necessitate an amendment to the traditional atomic theory.¹⁵ This amendment calls, as a very minimum, for the existence of a huge perfectly spherical finite physical atom which is hollow in its center except for its inner field. This single macroscopic atom contains and, because of its physical properties and finiteness, congests in its interior, all the microscopic particles of the whole of nature. It also provides the referent, in addition to the

¹⁵ *The Journal of Philosophy*, Vol. XXV. pp. 463, 464, 465. See this paper for details and evidence.

electrons and protons, without which discontinuity and atomic motion cannot be given meaning. Thereby it solves the problem of motion to which the general theory gave rise.¹⁶ Its fixed spherical form and congesting influence insure that the universe must exhibit, on the mean molar level in which we live, a relatedness or molar space-time structure which is a union of the contingent relatedness to which the motion of the microscopic particles gives rise, and the constant uniform relatedness which its own spherical form and congesting force is imposing.¹⁷ As was indicated in the original paper, such an entity necessitates a union of the electro-magnetic and gravitational field with molar space-time,¹⁸ and also places variability and uniformity in precisely those regions in nature where the general theory and the fact of successful astronomical measurements indicate that they exist.

This means two things with reference to the geometry of this universe. Firstly, it must be Riemannian. Otherwise, the variable potential distribution in local regions, to which the motion of the microscopic particles gives rise, as they compound to form molar bodies and molar motion, could not exist. Secondly, it must provide a meaning for metrical uniformity and constancy over great finite distances. Otherwise the macroscopic uniformity, which the macroscopic atom is imposing upon the contingent relatedness of the moving electrons and protons, would be equally non-existent.

It is hardly necessary to add that this is precisely the kind of geometry which Einstein has discovered in connection with his recent unification of the gravitational and electro-magnetic field. He writes: "The unitary field

¹⁶ Cf. *ibid.*, p. 460.

¹⁷ Cf. *ibid.*, pp. 471 ff.

¹⁸ Cf. *ibid.*, pp. 455, 462 ff.

theory is based on the following mathematical discovery: There are continua with a Riemannian metric and distant parallelism which nevertheless are not Euclidean."¹⁹ In other words, a geometry actually exists and has been explicitly formulated in mathematical terms, which possesses the peculiar combination of local variability and macroscopic uniformity in its metric, which the macroscopic atomic theory introduced in order to reconcile Einstein's original doctrine of the dependence of space upon matter, with Whitehead's doctrine of the necessity of metrical uniformity for measuring. Furthermore, as the macroscopic atomic theory suggested,²⁰ this geometry actually exhibits itself, upon the molar level of this universe, in the gravitational-electro-magnetic field.

A recourse to mathematical symbolism renders this point precise. In a recent article²¹ Eddington has stated Einstein's unitary field theory in terms of the same mathematical symbols as were used in Eddington's formulation of the traditional affine geometry. This makes possible an immediate comparison of the metrical properties of the two systems.

The affine geometry of Weyl and Eddington rested upon the equation

$$\frac{\partial A^\mu}{\partial x^\sigma} + \Gamma_{\epsilon\sigma}^\mu A^\epsilon = 0 \quad (1)$$

This was restricted by making

$$\Gamma_{\epsilon\sigma}^\mu = \Gamma_{\sigma\epsilon}^\mu \quad (2)$$

The significance of equation (1) is that it provides the metrical uniformity sufficient to indicate when two separate lengths are equal and parallel. Equation (2) insures that the parallelogram law holds, i. e. lines joining the ends

¹⁹ Cf. "A Simplified Discussion of 'Field Theories, Old and New,'" N. Y. Times, Feb. 3, 1929.

²⁰ Cf. *The Journal of Philosophy*, XXV, pp. 455, 462.

²¹ Cf. *Nature*, Vol. 123, p. 280.

of equal and parallel lengths are equal and parallel. It is necessary, however, to introduce metrical variability if space-time is to provide an expression for the potential distribution of gravitational and electro-magnetic fields. Since the two equations given above prescribe complete metrical uniformity, it is necessary to regard them as applying only over infinitely small regions and to locate the variability in the macroscopic connections which unite these microscopic uniformities. This is accomplished by regarding equation (1) as non-integrable and by introducing a curvature tensor $*B^\epsilon_{\mu\nu\sigma}$. Thus the traditional geometry of space-time located metrical uniformity in the infinitely small, and metrical variability in the macroscopically large regions of space.

The new geometry of Einstein exactly reverses this relationship. Equation (1) is accepted and regarded as integrable, thereby insuring a meaning for parallel displacement over any finite distance. The metrical variability, necessary for a unification of the spatial, gravitational and electro-magnetic fields, is attained by rejecting equation (2) for the equation

$$\Gamma^\mu_{\epsilon\sigma} = -h_\epsilon{}^\alpha (\partial h_\alpha{}^\mu / \partial x_\sigma), \quad (3)$$

in which $h_\alpha{}^\mu$ represents the quantities which are identified with the gravitational and electro-magnetic potentials at a given point. It is equation (3) which necessitates that the parallelogram law does not hold in the new geometry. The limitation which equation (1) places on equation (3) means that regardless of the local metrical variability, which gravitational and electro-magnetic potentials may introduce from point to point, sufficient metrical uniformity remains constant over macroscopic distances to provide a meaning for equal and parallel lengths. In other words, variation in the metrical structure of nature is a local

character and uniformity a macroscopic character of nature, as the macroscopic atomic theory indicated. At least, the type of metric which the latter theory necessitates is not incompatible with the demands of gravitational and electro-magnetic theory.

Since the macroscopic atomic theory was discovered and formulated independently of and previous to Einstein's latest achievement, it may be maintained therefore that his unitary field theory constitutes an additional argument for the macroscopic atomic theory. In fact, it is very difficult to understand how the metrical uniformity involved in distant parallelism can exist in a universe in which the metric of space-time is conditioned by the motion and distribution of matter, unless the macroscopic atom exists to offset the general contingent relatedness to which the motion of the microscopic particles gives rise.

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PHILOSOPHY AND EMBRYOLOGY: PROLEGOMENA TO A QUANTITATIVE SCIENCE OF DEVELOPMENT (II)

5. *Dynamic Teleology as an Occasion of Falling.*

IF, then, Bacon and his successors were right in banishing the concept of teleology from scientific thought, the quantitative, chemical, or exact embryologist need not be alarmed by the finalistic phenomena which, according to Rignano, interpenetrate the whole of ontogenetic development. In fact, it is not the phenomenon, but only one way of looking at it, that is finalistic, and it is this aspect of it that must be neglected in scientific work if the gravest confusion is to be avoided. Is there need for the biologist to be any more afraid of the Drieschian entelechy making what might be into what is and directing from within the development of the embryo in the egg or the uterus? The word "entelechy" as used by Aristotle meant that which exists in the highest sense of the word, whether actually or potentially, e. g., the sword in the mind of the swordmaker before a single one of the necessary operations of manufacture had been begun. The entelechy therefore operated on the process in question by means of the final cause, and did not reside in the changing entity if it was dead like the sword, though it did if it was alive like the embryo. Driesch frequently says that he uses the word in a quite different sense from Aristotle, but the majority of his

readers find it impossible to discover any essential point of divergence. He does at any rate make it much more precise than Aristotle, for he defines it as a non-spatial element in the living being, which at one time suspends possible action and at another time relaxes such suspension, acting in this way as the bearer of "individualising causality" and bringing the animal from potentiality into actuality.

It seems that this inherent immanent formative power has been translated by biologists of every period since Aristotle into the language of their time. Just as Driesch now tries to acclimatise it to the unfavourable environment of a post-Cartesian world, so St. Gregory of Nyssa, about 370 A. D., clothed it in the terminology of patristic times, and enunciated a theological variety of neo-vitalism. His most important biological works, *On the Making of Man*, and *On the Soul*, contain such passages as these, "The thing so implanted by the male in the female is fashioned into the different varieties of limbs and interior organs, not by the importation of any other power from without, but by the power which resides in it transforming it." And elsewhere, "For just as a man when perfectly developed has a soul of a specific nature, so at the fount and origin of his life, he shows in himself that conformation of soul which is suitable for his need in its preparing for itself its peculiarly fit dwelling-place by means of the matter implanted in the maternal body, for we do not suppose it possible that the soul is adapted to a strange building, just as it is not possible that a certain seal should agree with a different impression made in wax."

Thus the soul makes its body as if it were a gem making a stamp upon some soft substance, and acting during embryogeny from within—a conception essentially like that of Driesch. Many Renaissance authors adopted similar

views, e. g. Thomas Fienus. "No unsouled thing," says Gregory, "has the power to move and to grow. Yet there is no doubt that the embryo moves and waxes big as it is fed in the body of the mother." There is thus nothing new about Dynamic teleology; it is by no means the outcome of newly ascertained facts. It recurs from time to time in the history of biological thought because it is the natural result of an unscientific attitude.

I do not propose to discuss here the facts which originally led Driesch to the views expressed in his *Science and Philosophy of the Organism*, for they are very well-known, and have been shown by Jenkinson, Jennings, Warren, and Boveri, among others, to be interpretable on quite other lines. The mechanical view which has shown itself equal to providing working hypotheses for so many "irreducible and stubborn" facts already can deal unaided with the phenomenon of totipotence. Nor shall I demonstrate by a comparison of passages from Driesch and Paracelsus how closely the conception of immanent formative force or entelechy approaches the master-archaeus of Paracelsus and the later iatro-chemists such as Stahl, though this could easily be done, and Driesch has, in fact, to a large extent done it himself in his *History and Theory of Vitalism*. One may legitimately infer from this that the Drieschian entelechy has been and will be no more use as a practical working hypothesis for the laboratory than the archaeus was in the past.

Driesch's Dynamic teleology is open to much more serious and more fundamental objections. These were not obvious at the first appearance of his Gifford Lectures, but were clearly brought to light through the controversy which Jacques Loeb had with H. S. Jennings concerning tropisms. Loeb's theory entirely dispensed with any psychological factors, but Jennings upheld the view that they

might be legitimately brought into scientific discussion, provided they were regarded as being determined as well as determining. He considered that the pursuance of laboratory work demands as its minimum of system what he called Radical Experimental Determinism, and that there was difference of opinion as to whether this might regard conscious or unconscious mental processes as links in the chain of determinate causation. On this point Jennings and Loeb were antagonists, but both were united against Driesch, from whose writings it now appeared that psychical events might or might not affect physical events according to circumstances, and that the entelechy was subject to no general laws. Neal had maintained that the experimentally discoverable perceptual determiners in living things were insufficient to account for the effects produced in them. Jennings pointed out that, if this meant that the non-perceptual (mental) determiners acted supplementarily to the others and not instead of them, it was compatible with radical experimental determinism. But if it was said that some of the determiners were non-perceptual and could not be known at all, then it was incompatible. Now it was just this that Driesch had been saying. "A complete knowledge," he wrote, "of all physicochemical things and relations (including possible relations) of a given system at a given time does not give a complete characterisation of that system if it is a living system." He modified this as follows, "Practically we may say that complete knowledge of the physicochemical constitution of a given egg in a given state and of the behaviour following this constitution in one case, implies the same knowledge for other cases (in the same species) with great probability. But this is a probability in principle and can never be more. It would not even be a probability if we did not know the origin of a given egg

in a given state, i.e. that the egg was the egg, say, of an ascidian. But to know this history or origin is, of course, already more than simply to know its physicochemical constitution and its consequences in one case, which suffices in the realm of the inorganic. It may be that the eggs of echinoidea, fishes, and birds, are the same in all the essentials of physico-chemical constitution. Something very different happens in each case on account of the different entelechies. In spite of this we know with great probability what will happen from one case if we know that this egg comes from a bird and that from an echinoid. Therefore, practically, experimental indeterminism is not a great danger for science."

But the matter was taken up by various writers, and Lovejoy, especially, defended Driesch from the charge of interfering with the fundamental necessities of scientific thought. Jennings, however, was able to publish in reply letters from Driesch in which these implications of his position were fully admitted. "Two systems absolutely identical in every physico-chemical respect may behave differently under absolutely identical conditions if the systems are living systems. For the specificity of a certain entelechy is among the complete characteristics of a living organism and about this entelechy knowledge of physico-chemical things and relations teaches absolutely nothing." It was generally felt after this that if Driesch was right biologists might as well sell their farms and go to sea in despair.

In this connection it is interesting to recall the vivid account given by Claude Bernard of the polemic he had with Gerdy at the Philomathic Society in Paris, for the Driesch-Lovejoy-Jennings controversy simply repeated on a larger scale the arguments of the two Parisian biologists

sixty years before. "In 1859," says Claude Bernard, "I made a report to the Philomathic Society in which I discussed the experiments of Brodie and Majendie on ligature of the bile-duct, and I showed that the divergent results which the two experimentalists reached depended on the fact that one operated only on dogs and tied only the bile-duct, while the other operated only on cats, and, without suspecting it, included in his ligature both the bile-duct and a pancreatic duct. Thus I showed the difference in the results they reached and concluded that in physiology as everywhere else experiments are rigorous and give identical results wherever we operate in exactly similar conditions. A propos of this a member of the Society took the floor to attack my conclusions; it was Gerdy, a surgeon at the Charité, professor in the faculty of medicine and known through various works in surgery and physiology. 'Your anatomical explanation of these experiments,' said he, 'is correct, but I cannot accept your general conclusions. You say, in fact, that the results of experiments in physiology are identical; I deny it. Your conclusion would be correct for inert nature but cannot be true for living nature. Whenever life enters into phenomena,' he went on, 'conditions may be as similar as we please, the results may still be different.' To support his opinion Gerdy cited cases of individuals with the same disease, to whom he had given the same drugs with different results. He also recalled cases of like operations for the same disease, but followed by cure in one case and death in another. These differences, according to him, all depended on life itself altering the results, though the experimental conditions were the same, but this could not happen, he thought, in the phenomena of inert bodies, where life does not enter. Opposition to these ideas was prompt and gen-

eral in the Philomathic Society. Everyone pointed out to Gerdy that his opinions were nothing less than a denial of biological science, but he would not give up his ideas and entrenched himself behind the word 'vitality.' He could not be made to understand that it was only a word, devoid of meaning and corresponding to nothing, and that saying that something was due to vitality amounted to calling it unknown." Is the entelechy which confers on embryonic development the character of a personally conducted tour any different in nature from the vitality which interfered with Gerdy's pharmacological experiments?

Driesch and Rignano, then, agree in emphasising the teleological aspect of living beings, especially as exemplified in their embryonic development, but they differ in that Driesch gives up apparently all hope of causal explanation in ontogenesis, while Rignano, postulating no clearly defined entelechy, relies on the notion of a special variety of energy, something like the biotic energy of Benjamin Moore or T. P. Nunn, as the carrier of the special purposive aspects of life. This truly uncalled-for assumption leads Rignano into a series of singularly complicated hypotheses, such as the law of specific accumulation, and the centro-epigenetic theory, which cannot be discussed in detail here. It may be mentioned, however, that they involve the old-fashioned conception of "biogen" or living molecules, long ago given up by biochemists, (surely, in this case, the best judges) and provided with a funeral oration by Hopkins in 1913.

The Finalist and Dynamic-teleological schools would do well to study the thought of Claude Bernard more closely. Bernard was so subtle a thinker that it has always been a point of great difficulty to classify him with any of the main currents of biological thought, and, while Dastre

has claimed him as a mechanist, Driesch has delineated him as an exponent of Dynamic teleology. But the following passage seems to me to sum up as well as any other the main shape of his ideas. "When a chicken develops in an egg," said he, "the formation of the animal body as a grouping of chemical elements is not what essentially distinguishes the vital force. This grouping takes place only according to laws which govern the physico-chemical properties of matter; but the guiding idea of the vital evolution is essentially of the domain of life and belongs neither to chemistry nor to physics nor to anything else. In every living germ is a creative idea which develops and exhibits itself through organization. As long as a living being persists it remains under the influence of this same creative vital force, and death comes when it can no longer express itself; here, as everywhere, everything is derived from the idea which alone creates and guides; physico-chemical means of expression are common to all natural phenomena and remain mingled pell mell, like the letters of the alphabet in a box, till a force goes to fetch them to express the most varied thoughts and mechanisms. This same vital idea preserves beings by reconstructing the vital parts disorganised by exercise or destroyed by accident or disease. To the physico-chemical condition of this primal development, then, we must always refer our explanation of life, whether in the normal or pathological state." Here Bernard seems to recognise the significance of universal teleology, for he says, "here, as everywhere, everything is derived, etc." and at the same time he lays stress on the identification of the physico-chemical aspect with the scientific aspect, going on, indeed, to say that "physiologists can only act indirectly through animal physico-chemistry, i.e. physics and chemistry worked out in the field of life, where the necessary conditions of all

living organisms develop, create, and support each other according to a definite idea and obedient to rigorous determinism." It is true that elsewhere he identifies this "force that goes to arrange the letters of the alphabet" with the "mediating nature" of Hippocrates and the *archaeus faber* of Van Helmont. Had he read more in Lucretius than in Aristotle, he might rather have identified it with the necessary outcome of the constitution of matter, a suggestion more profoundly in harmony, perhaps, with the natural bent of the scientific consciousness, (Cf. Bacon's remarks on Democritus in *De Augmentis Scientiarum*). But, even so, he evidently regards it as the subject-matter of metaphysics and not of science, for he says in the next paragraph, "The term 'vital properties' is only provisional because we call properties 'vital' which we have not yet been able to reduce to physico-chemical terms, though doubtless we shall succeed in that some day."

6. *The Rock of Offence, Organicism*

By making use of the thought of Bernard, we pass by an imperceptible transition from Finalism and Dynamic teleology to Organicism, another of the principal forms in which the opposition to exact biology appears. This, like some of the other doctrines I have mentioned, has a long history behind it. The notion, "We murder to dissect," finds clear expression as early as 200 A. D., when Q. Septimius Tertullianus of Carthage, one of the Western Fathers, spoke thus of Herophilus, the Alexandrian anatomist: "Herophilus, the physician, or rather butcher, dissected 600 persons that he might scrutinise nature, he hated man that he might gain knowledge. I know not whether he explored clearly all the internal parts of man for death itself changes them from their state when alive,

and death in his hands was not simply death, *but led to error from the very process of cutting up.*" No more excellent statement of the organicistic viewpoint could be devised. Sir Kenelm Digby in 1644 gave an even clearer summary of this point of view, and even in the rationalistic eighteenth century there were scientific men who insisted that the living being was an organism. Cuvier took a very definite stand on this question when he said, "All the parts of a body are inter-related, they can act only in so far as they all act together; trying to separate one from the whole means transferring it to the realm of dead substance and entirely changing its essence." But the name most familiarly associated with biological organicism in this country is that of J. S. Haldane, who has frequently set forth his views upon this subject. His attitude is so well known that it need not be described here. The living animal, he holds, is a constellation with a far higher degree of internal relatedness than any non-living system; the organic, in fact, cannot be understood by a study of its parts though the inorganic very possibly can. In other words, an organism is an entity whose parts lose all their characteristic properties when they are studied away from the organism itself; they fall, as it were, into meaninglessness, as soon as they are abstracted from the whole of which they are parts. Consequently that kind of biophysics, and *a fortiori* biophysical embryology, which analyses living organisms, is unsatisfactory as an apparatus for understanding living things and should give place to studies in which organisms are regarded intact. Moreover, it is only in the untouched organism that those wonderfully well-balanced actions are seen by which the animal or plant holds to its own niche in the economy of nature, resisting every attempt to dislodge it, provided the attempt be not so successful as to disorganise the living thing. This power of

maintaining a constancy in its external and internal environment is what Haldane regards as the *deus ex machina*, the property of living things essentially inexplicable by physico-chemical hypotheses and requiring special biological language for its formulation. "All attempts," he says, "to trace the ultimate mechanism of life must be given up as meaningless. The aim of biology becomes a very different one—to trace in increasing detail, and with increasing clearness, the organic determination which the organic conception formulates." Another aspect of Haldane's teaching was the view that the living animal was in some way more real than the world of physics; physics and biology, he thought, might some day coalesce, but it would then be found that physics would not have swallowed up biology; rather the contrary would occur and biology would swallow up physics. "The idea of life," he said, "is nearer to reality than the ideas of matter and energy, and therefore the presupposition of ideal biology is that inorganic can ultimately be resolved into organic phenomena, and that the physical world is thus only the appearance of a deeper reality which is as yet hidden from our distinct vision and can only be seen dimly with the eye of scientific faith."

There had been precursory voices of all this in the nineteenth century, as when, in spite of the discoveries of Cagniard de Latour and others that the yeast-cell played an essential part in fermentation, Justus von Liebig refused to credit them, fearing that their suggestions were a return to explanations by vital force. "Chemical actions may very well explain physiological actions, but certainly not *vice versa*," said Moritz Traube. Claude Bernard, moreover, discussed the matter with his usual subtlety. "Physiologists," he said, "must not forget that a living being is an organism with its own individuality. Since physicists and chemists cannot take their stand outside the

universe they study bodies and phenomena in themselves and separately without necessarily having to connect them with nature as a whole. Physiologists, on the contrary, find themselves outside the animal organism which they see as a whole, even when trying to get inside so as to understand the mechanism of every part. The result is that physicists and chemists reject all idea of final causes for the facts which they observe while physiologists are inclined to acknowledge an harmonious and pre-established unity in an organised body, all of whose actions are independent and mutually generative. If we break up an organism for the sake of studying its parts it is only for the sake of ease in experimental analysis, and by no means in order to conceive them separately. Indeed, when we wish to ascribe to a physiological quality its value and true significance we must always refer it to this whole and draw our final conclusions only in relation to its effect on the whole. It is doubtless because he felt this necessary interdependence among the parts of an organism that Cuvier said that experimentation was not applicable to living beings since it separated organized parts that should remain united. For the same reason vitalists proscribe experiments in medicine. These views, which have their correct side are nevertheless false in their general outcome and have greatly hampered the progress of science." Bernard did not commit himself to an absolutely unambiguous statement as to the correct and incorrect side of organicism, and seems to have regarded it as only true in the sense that imaginative synthesis should follow radical experimental analysis. He was therefore quite opposed to that true and keen-edged organicism represented by Cuvier and later by Haldane, which denied the bare utility and legitimacy of the experimental analysis, and which was not unjustly satirised by Woolf in 1927:—

"You cannot demonstrate the soul
Except upon the animal as a whole
Spiritual autolytic changes begin

As soon as you push a needle through the skin."

Haldane's writings and those of his school, such as J. A. Thomson and C. G. Douglas, had, however, little effect on the direction taken by biological science in the first years of this century. As A. D. Ritchie pointed out, it is extraordinarily difficult to find out anything about living systems, unless their parts are treated in isolation, even if that be recognised as but the preliminary for imaginative synthesis, and as many observers said, Haldane's own researches in the physiology of breathing afforded an excellent example of the usual scientific method. Biological research proceeded steadily on the usual lines, for Haldane's practical counsels could only be followed by those who were willing to abandon causal explanations in biology or to give up the hope of biology becoming an exact science.

An influence was at hand, however, which was to lessen very much, if not to destroy altogether, the attraction of Haldane's opinions for biologists. A. N. Whitehead boldly extended the concept of the organism to cover all objects, i. e. all events, non-living as well as living. The word "inorganic" would thus cease to apply to non-living nature and all physical systems would be regarded as in a sense incomprehensible, except when regarded as wholes composed of parts owing their very existence to their share and arrangement in the whole in question. Quoting Tennyson's, " 'The stars,' she whispers, 'blindly run'," he remarked that an electron within a living body is different from an electron outside it only by reason of the plan of the body. The electron blindly runs within or without the

body, but it runs within the body in accordance with the general plan of the body and this plan includes the mental state. "But this principle of modification is perfectly general throughout nature, and represents no property peculiar to living bodies." Lloyd Morgan recognised in these Whiteheadian organisms his "systems of relations going together in substantial unity," which he had conceived of as stretching in degrees of ever vaster complexity from the smallest physical event to the universe itself. It was Lloyd Morgan, indeed, who first pointed out the significance of Whitehead's arguments for biological thought. He showed that the extension of organicism to cover the entire world of physics had no serious consequences for biological mechanists, who would continue to employ physico-chemical methods as before; provided that they had not adopted some form of scientific naturalism. At the same time, it could have little help for those who had insisted that the principal characteristic of living things was their organismic character, and had been led by this to propose far-reaching alterations in scientific logic or to give up the hope of causal explanation in biology. If, as it would seem, there are organisms everywhere, then the position that there are organisms nowhere turns out to be better placed than the position that living things are organisms and not other things, for, in the former case, peace can be at once secured through the Kantian method, while in the latter case the irreducible characteristic of life is not organicism, whatever else it may be. As has been pointed out, Haldane's prophetic observations concerning the eventual meeting-place of physics and biology have perhaps at last been justified, but, if so, with but a barren benefit to neo-vitalism.

7. *Emergence*

We may now pass, by another small transition, from Organicism to theories of Emergence. Neo-vitalism in this form practically ceases to have any claim to the name, and approaches extremely closely to neo-mechanism. The principle of emergence in its simplest form is presumably the statement that there are levels of existence in the universe, at each of which some more complicated form of being comes into existence, containing some essence absolutely new, and which could not have been predicted, even if all the properties of the constituents of the lower order had been known. This is evidently a conception very close to that of the organism, for just as the living or non-living system, looked at from one point of view, ceases to be itself as soon as it is dismembered, so the new level of complexity, looked at from one point of view, consists of lower levels of complexity joined together in a way that could not have been foreseen, because its properties and peculiarities are not the sum of the properties and peculiarities of its constituents. But it is important to note that there are here two parentheses, namely, "looked at from one point of view," implying that there is another point of view, and though the discussion is complicated by the doubt as to whether Whitehead intends his organisms to be taken as a metaphysical theory, or as a scientific theory, yet in Lloyd Morgan the statement is clear that the emergent point of view has always a complementary one, the resultant point of view, "the emergent web and the resultant woof," as he calls it. This is really a new and more accurate way of putting the ancient antithesis of mechanism and teleology, for the scientific method involves the concept of resultance, since it continually seeks for the pre-determining causes which must be in some way uniform

with their effects, while the advent of something absolutely new at each level, i.e., atom to molecule, colloidal aggregate to living cell, etc., is a speculation hardly germane to science and resembling the final cause.

We find ourselves back again, then, at the distinction between metaphysics and science, which was first seriously studied by Kant. Most of the confusion has arisen in the past through an insufficiently clear decision as to the nature of biology. Biology cannot be philosophical and scientific, emergent and resultant, indeterminate and determinate, teleological and mechanical at one and the same time.

8. *Neo-mechanism as the Apologetic of Physico-chemical Embryology*

Enough has now been said of the principal philosophical obstacles to exact, quantitative, or physico-chemical embryology, and nothing now remains but to outline its own theoretical basis. Anyone who was dissatisfied twenty years ago with the various forms of neo-vitalism which have already been discussed would have had no alternative but to accept the simple, though rather incredible, scientific naturalism of the preceding century, unless, indeed, he was acquainted with German philosophy, and understood the momentous consequences which flow from the apparently technical question, "How are *a priori* synthetic judgments possible?" The varieties of neo-vitalism may perhaps be thought of, in so far as they were not modern forms of difficulties which have for many centuries perplexed philosophers, as a series of reactions against mechanistic biology insufficiently distinguished from scientific naturalism. This confusion is well seen in the earlier phases of the American discussion which led up to the symposium of 1918. It is often impossible to tell, as in the papers of Nichols, Ritter,

More and Fraser-Harris, whether they are attacking the mechanical theory of the universe regarded as an ultimate metaphysical faith or the mechanical methodology of science.

Historically speaking, the starry heavens with their infinite spaces that terrified Pascal, and their mechanical order revealed by Kepler and Copernicus on the one hand, and the moral law with its teleological and theological implications, on the other hand, were never really faced at one and the same moment and taken seriously together until the time of Kant, who first subjectivated what had before struggled in the external world, and demonstrated that the contradictions of our thought sprang from the constitution of our own intelligence. "It has always been assumed," he said, "that all our knowledge must conform to objects. The time has now come to ask, whether better progress may not be made by supposing that objects must conform to our knowledge." *Omnis enim longe nostris ab sensibus infra primorum natura jacet.* . . . Lucretius had said, but Kant went further, and suggested that our intelligence can help us no more than our senses in the attempt to see things as they really are.

That many other currents of thought flow through the three great Critiques is a matter of comparatively small moment; this was the great service that Kant performed for philosophy, and in the light of it the scientific mind was relieved of the burden of having to believe finally in its own account of the world. But in the scientific controversies of the last century, Kant was forgotten, and the continual successes of the scientific method led to a naturalistic outlook, which was wholly unsatisfactory. It was supported by T. H. Huxley, Herbert Spencer, W. K. Clifford, Tyndall, Ray Lankester, and many others: it apparently still is by Chalmers Mitchell. But, as a widely

accepted attitude, it did not live long into the present century, and from such blows as Ward's *Naturalism and Agnosticism* and Aliotta's *The Idealistic Reaction against Science*, it never recovered. Physico-chemical biologists were thus left, as it were, without visible means of support, and existed for some time on a purely pragmatic basis, devoid of any epistemological comfort. Gradually, however, an attitude came into being which has been termed "Neo-mechanism." Karl Pearson provided an intimation of it when he said, "Those who say that mechanism cannot explain life are perfectly correct, but then mechanism does not explain anything. Those, on the other hand, who say that mechanism cannot describe life are going far beyond what is justifiable in the present state of our knowledge." A clear enunciation of it, informed with the charm of all his writings, was given by d'Arcy Thompson in the Aristotelian Society Symposium of 1918: "In the concepts of matter and energy," he said, "the Whole is not enshrined, mechanism is but one aspect of the world. These are the proper categories of objective science, but they are no more: the physicist is, ipso facto, a mechanist, but he is not by implication a materialist; nor is the biologist of necessity a materialist, even though he may study nothing but mechanism in the material fabric and the bodily activities of the organism."

But the two most definite recent statements of neo-mechanism are perhaps R. S. Lillie's memoir entitled "The Nature of the Vitalistic Dilemma," in the *Journal of Philosophy*, and a paper by the present writer in the *Hibbert Journal*, which were published almost simultaneously at the beginning of 1927. Lillie began by some ordinary observations on the past successes of physico-chemical causal explanations in biology. He then discussed the finalism of Rignano and applied to it an idea which he had previously

worked out with great ingenuity, namely, that all actions of living things which exhibit purposiveness or prospective significance may really be considered as factors tending to maintain the general world-equilibrium of species, both of that to which the individual animal belongs, and of all the others indirectly also. In this way there might be a mechanical aspect, as it were, of teleology, and purposiveness might be translated out of its native metaphysical language into scientific terms. It is doubtful, however, whether teleology retains any of its intimate characteristics when it is twisted into the terminology of dynamic equilibrium between species. It is much better to confine it to philosophy, as is presumably Kant's conclusion, when he speaks of the methodology of the teleological judgment, and excludes it from theology as well as natural science. But Lillie concluded that mechanical regularity and determinism—the necessary conditions for the action of any machine—are implied in any predetermined course of action leading to a definite end. The attainment of any such goal at all requires a mechanism, a regular succession of like actions and an invariance in the conditions of action. To say this is to accept the Aristotelian idea of two complementary bases of natural phenomena, teleology and mechanism, existing side by side, inextricably intertwined in the external world. The recognition of this is the first step towards the Kantian subjectivation. "Every biologist is aware," says Lillie, "in his non-professional moments that the possibilities of life are larger than the mechanistic view implies. This is only another way of acknowledging that the whole mechanistic conception is an incomplete, derivative, or abstract one. To regard it as philosophically final is a grave mistake." Thus Lillie remains convinced of the adequacy of physico-chemical biology, but expressly repudiates the elevation of mechanism into a metaphysic.

Lillie goes on to discuss the abstract, distorted and incomplete character of the world which is presented to us by the employment of the scientific method. "To say," he proceeds, "that life is 'nothing but' a combination of chemical reactions in a colloidal substratum is unscientific. Life may be and apparently *is* that in part but to regard any such scientific formulation as a complete and adequate representation of its total reality is simply to misconceive the structure of science." This is well said; life is indeed a "dynamic equilibrium in a polyphasic system," but also "Life is a manifestation of emergent creativity," "Life is a pure flame and we live by an invisible sun within us," "Life is a sad composition, we live with death, and die not in a moment," and, if you will,

"Life, like a dome of many-coloured glass,
Stains the white radiance of eternity
Until death tramples it to fragments."

"The dilemma of vitalism is irresolvable," says Lillie, "so long as we regard the units, concepts, and formulae found valid in physical science not as abstractions but as primary and self-existent realities, by a combination of which all the properties of living beings as of other natural phenomena can be derived." The former view incorporates within itself that grain of truth which vitalistic views have always had; the latter has no place for it and embodies an ultimate philosophy teeming with metaphysical impossibilities, the greatest of which is probably that ancient materialistic ὕστερον πρότερον, the denial of the logical priority of mind.

My own treatment of the subject differed from Lillie's in its line of argument, but arrived at exactly the same conclusion. I contrasted what might be called the Democritus-Holbach-Huxley attitude in biology with the Driesch-Haldane-Russell-Rignano attitude, and concluded after ex-

amining them that both involved insuperable difficulties. The former led to the sterile plains of metaphysical naturalism, the latter presupposed impractical alterations in scientific methodology. Lotze was the philosopher to whom I went for help in the elaboration of a better standpoint. "The true source of the life of science," said he, "is to be found, not indeed in admitting now a fragment of one view and now a fragment of the other, but in showing how absolutely universal is the extent and at the same time how completely subordinate is the significance of the mission which mechanism has to fulfil in the structure of the world." And in another place, "We granted validity to the mechanical view in so far as concerns the examination of the relations between finite and finite and the origin and accomplishment of any reciprocal action whatever; we as decidedly denied its authority when it claimed acceptance, not as a formal instrument of investigation, but as a final theory of things." "Nowhere is mechanism," says Lotze, "the essence of the matter, but nowhere does being assume another form of finite existence except through it."

I went on to argue that, although Lotze made every effort to demonstrate how mechanism and teleology could fit together in the universe, he failed to do so convincingly, and that it was more satisfactory to follow the Kantian method, and make them necessary results of the priority of our ways of thought. "We may regard," I said, "the mechanistic view of the world as a legitimate methodological distortion, capable of application to any phenomenon whatever, and possessing no value at all as a metaphysical doctrine." Mechanism is, in fact, whichever of its forms defined by Broad, Cohen, Krikorian, and others, turns out to be the minimum requirement of science, not metaphysical materialism. It is necessary to maintain it on

methodological grounds, but it is pernicious to allot it any wider value. It stands, in fact, as one of the kinds of way in which the human spirit reacts to the universe in which it finds itself, and it springs, as R. G. Collingwood puts it, directly from the ultimate root of all science, the assertion of the abstract concept. "He who generalises is an idiot," said William Blake, but that was an aphorism characteristic of the poetic or the religious mind. The scientific spirit is as profound as these, but it sets out upon a different path from the very beginning and reaches in the end a country different in every way. It directs its interest from the first to resemblances and differences between phenomena rather than to individual phenomena themselves, and the impulse to classify leads inevitably to the supremacy of mechanical causation. It stands "at diameter and sword's point" with observations such as "Everything is itself and not something else" and "Nothing is ever merely anything."

R. G. Collingwood has expressed this in a very memorable passage: "Mathematics, mechanics, and materialism are the three marks of all science, a triad of which none can be separated from the others, since in fact they all follow from the original act by which the scientific consciousness comes into being, namely, the assertion of the abstract concept. They are all, it may be said, products of the classificatory frame of mind, corollaries from the fact that in this frame of mind the universal and the particular are arbitrarily separated and the universal asserted in its barren and rigid self-identity. It is this barrenness and this rigidity which confer their character upon the doctrines of scientific materialism. Hence it is idle to imagine that materialism is justified in some sciences and not in others. It is idle to protest that science ought to surrender its materialistic prejudices when it finds itself face to face

with a non-material object such as the soul. No object is material, in the metaphysical sense of the word, except in so far as scientific thinking conceives it so; for materiality means abstractness, subjection to the formulae of mechanical determination and mathematical calculation, and these formulae are never imposed upon any object whatever except by an arbitrary act which falsifies the object's nature. This only appears paradoxical when we fail to see the gulf which separates the common-sense materiality of a table, its sensible qualities, from its metaphysical materiality, the abstract conceptual substrate of those qualities. It is this substrate whose transcendent or abstract existence is asserted by materialism. Hence we cannot distinguish objects like tables which are really 'material' from objects in whose presence science must unlearn its materialistic habits of thought. Materialism is no more the truth in physics than in psychology, and no less. It is the truth about any object, just in so far as this object is by abstraction reducible to terms of pure mathematics; and no object is so reducible except by consciously or unconsciously shutting our eyes to everything which differentiates it from anything else. This conscious or unconscious act of abstraction is the very being of the scientific consciousness; and it is therefore no matter for pained surprise when science shows a bias towards determinism, behaviourism, and materialism generally."

By this time the general outlines of this theoretical excursus should have become clear. Embryology, to put it plainly, has been for so many years the happy hunting ground of vitalistic and neo-vitalistic theory that those who hope to see it become an exact science can hardly do without some kind of defence for their labours. "Vitalistic conceptions," said Claude Bernard in 1875, with the voice

of authentic prophecy, "can no longer hover over physiology as a whole. The developmental force of the egg and the embryonic cells is the last rampart of vitalism, but in taking refuge there, it transforms itself into a metaphysical concept and snaps the last link connecting it with the physical world, and the science of physiology."

It is to be hoped that what has been said will place in a right light the aims of the newer or physico-chemical embryology, and provide it, as it were, with its decretals. That they are not false will be the hope of every exact biologist.

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THE NATURE OF CHANGE

I

IT has been customary for certain recent idealists who hold that change is unreal to assume that the decisive question to be asked in an enquiry into change is the blunt and obvious question, *what changes?*¹ Change, it is said, clearly implies something that changes. What, we should ask, first and foremost, is this something that changes? The result of this quest, however, it has always been shown, is anomalous. The idealist has clearly established not only that he cannot say but that no one can truthfully say what it is that changes. This conclusion has sometimes been challenged but I think it is true. Nothing changes and the question, *what changes?*, can be given no positive defensible answer. The idealist at this point, however, has always taken a farther step. He has held not only that nothing changes but that because nothing changes, change is a mere appearance and not a reality. Realities, it is commonly admitted, appear to change, but in truth, as the argument shows, no reality can change. So change, the idealist argues, is a seeming, an external show: it is a deceptive appearance which realities sometimes have for us but only this and it is not itself a reality. I think this conclusion is indefensible and invalid, and the chief negative aim of this essay is to show that it is false. This I shall

¹ E. g. McTaggart, *The Nature of Existence*, vol. 2, pp. 12 ff., and Bradley, *Appearance and Reality*, eighth impression, pp. 45 ff.

develop in section two below. The chief positive aim of this essay, to be developed in sections two and three below, is to show that change is indeed substance and that the nature of change, far from being the nature of a deceptive appearance, is the nature of a genuine and a *bona fide* form of reality.

Before I develop either of these theses however, one point should be made certain. This is that the idealist's claim that nothing changes or that change is the property of no reality, is true. We have said that it is true but such a position, as we observed, has sometimes been challenged. Our assertion thus should be given proof. I will therefore first of all endeavor to establish briefly and without undue repetition of familiar arguments that nothing changes or that change is the property of no reality. Then I will consider and seek to determine what necessarily follows and what does not necessarily follow as to the nature of change from the fact that this is true.

II

Let us therefore first ask, *what changes?* The realities commonly believed to change are things and thoughts, events and facts, qualities and relations. Or at least some of these are some of them. Let us call any reality said to change *A*. Then *A* is a thing or a thought, a fact or an event, a quality or a relation, or a reality similar to these. It is clear that the realities represented by *A*, if they change, must change as whole or else they must change at some point where they are not yet whole. Accordingly we may ask:—when *A* is said to change, is it meant that *A* as a whole, *i.e.* *A* as all it ever really is, changes? Or is it meant that *A* as it is before it is all it ever really is, changes? One is meant. Which?

The first alternative is plainly impossible. *A* as

whole or A as all it ever really is, cannot change. For a reality can change, if at all, only into what it can really be. But A as a whole is already all A can ever really be. There is thus no change possible to A here. Accordingly when a person asserts that A changes, he must mean that A as it is before it is all it ever really is, changes. But this position has two defects. In the first place, strictly speaking, the reality said to change is certainly not A but P —where P is A as it is before it is all it ever really is. And in the second place, when P is said to change, we may legitimately ask, is it meant that P as whole changes or that P as it is before it is all it ever really is, *i.e.*, p changes? Clearly one of these must be meant when P is said to change. Yet in neither case does P change. For if it is said that it is P as it is before it is all it ever really is, that changes, then, strictly speaking, it is p and not P that here changes—if anything does change. But if it is said that P as whole changes, how, we may ask, can this be? For P as whole is all P ever can really be. And since a reality can change, if at all, only into what it can really be, there is here no real change possible to P .

I take it that this argument is conclusive. For clearly we start an infinite regress if we go farther—*i.e.*, if we affirm that after all it is p that changes. For once again we may ask: it is p as whole or p as it is before it is all it ever really is, that changes? And once we ask this question it is clear that p itself cannot change and that in the search for the changing we should be forced to split up p as we have already been forced to split up P and A . And this would have no end. The argument is therefore conclusive: a changing reality can never be reached. The principle of the argument is this: if in the search for a changing reality you consider the reality said to change

as less than the whole of what it really is, you have, strictly speaking, only a section of the reality and not the reality itself; but if on the other hand you consider the reality as the whole of what it really is, you have indeed the reality but you have not and cannot have change. This principle automatically re-applies in any attempt to escape it by finding change in a sub-division of the original reality. There is therefore no way of genuinely evading it.

The idealist so far is consequently correct. *A* cannot change and no sub-division of *A* can change. And therefore no thing or thought, no fact or event, no quality or relation, or any other reality, can truly be said to be a changing reality or to possess the property of changing.

III

It will be remembered that we wished to establish this point merely by way of introducing properly the consideration of a deduction commonly made from it by the idealist. The deduction is this, that change is not real. Realities, it runs, appear to change and in common speech we constantly assign to them the property of changing. But truly, as we have just seen, no reality can change. Therefore change is a mere appearance, a seeming commonly believed but not true. And apart from this it is a deception and not at all a reality.

I think that this deduction is invalid. It appears innocently to follow from the mere fact that nothing can change. But really, to have genuine necessity and validity, it requires not merely this fact. It requires also that the assumption underlying the initial question, *what changes?*, is one which we have to admit. This assumption is that change is a property or a quality of a something that changes. When we ask the question *what changes?*, that is, we assume that change is a property or a quality of a some-

thing changing. If this assumption were genuinely necessary, if change to be a reality had to be a property or a quality, then I think that the above argument which shows that change cannot really be a property or a quality, would also have established that change is not real. But must we assume as does the idealist who asks *what changes?*, that change is a property or a quality? I see no necessity for this. Uncritical thought, as well as the idealist, it is true, constantly assumes that change is a property or quality and is forever talking about changing thoughts and changing things, and so on. But critical thought I think may equally assume that change is something entirely different from a property or a quality. For instance, critical thought may assume that change is substance—*i.e.*, that which among other things possesses properties and qualities but is not itself a property or a quality.² This assumption is perfectly open to critical thought. Indeed cogent reasons may be given why critical thought not only can make this assumption but can also hold that unlike the assumption of the idealist and of common thought it actually fits the case of change. If this is true and I shall argue in a moment that it is true, then the fact that nothing can change certainly does not prove that change is not real. It merely proves that change can not be, as commonly assumed and as assumed in the question *what changes?*, a property or a quality of anything real. I think it does prove this and that change is not a property or a quality of anything real. But so long as we may assume and assume with reason that change may be some other form of reality than a property or a quality, I think that the above dialectical victory of the idealist certainly

² The exact definition of substance is: substance is that which possesses characteristics but is not itself a characteristic. By a characteristic is meant a quality (a property) or a relation. This definition is the definition of substance ably expounded by McTaggart in *The Nature of Existence*, vol. 1, chap. 6.

does not prove anything more than that change is not the kind of reality that it is commonly assumed to be.

Critical thought as against common thought, we say, may assume that change is substance, not property or quality. Indeed I think it should assume that change is substance. And this is the central thesis of this essay. This thesis is based on the fact that the assumption is not only abstractly possible (as is any assumption) but is actually necessitated by a combination of three circumstances, which are these:

(1) Change appears to be a fact. Indeed Mr. Bradley who argues against the reality of change, says that change certainly is a fact.³ This is arresting. We may indeed insist with Mr. Bradley that metaphysics cannot accept facts uncritically. But if we are confronted with a fact that certainly is a fact, we should certainly try out every plausible explanation of this fact before we condemn it as a mere appearance. Otherwise we surely cannot be said to have dealt with this fact critically.

(2) The assumption that change is substance however is not only one whose trial a critical understanding should in this case demand, but it appears anyway to be forced upon us by the outcome of the argument that change cannot be a quality. Two properties of every substance, as we have said, are that it possesses qualities and that it is not itself a quality. Change possesses qualities as we shall see, and it is not itself a quality as the above argument has established. Thus change appears to have the properties that a substance always has. An objection may be made to this. The above argument, it may be said, proves only that change cannot be a quality, but this no more forces us to assume that change is substance than it forces us to assume that change is relation.

³ Cf. *Appearance and Reality*, p. 206.

Indeed it may be contended that change is relation—*e.g.*, the relation between substances and their qualities. This contention I think is wrong. In the first place, change certainly cannot be the relation between substances and qualities. For a quality as a quality is possessed by a substance and a substance as such possesses its qualities, so that each stands to the other in the relation of possession. But the mere connexion of possession is not the fact of change. A shoe may possess blackness and blackness may be possessed by a shoe, but the connexion existent between the shoe and the blackness is certainly not the fact of change. In the second place, change cannot anyway be a relation at all. For a relation is always a connexion between terms, whereas a change is always an event—it is, for instance, the occurrence of a new connexion between the terms or the occurrence of a new set of terms. A change, that is, is a happening of the new, whereas a mere connexion between terms or a relation is never the happening of a new connexion nor the happening of anything old or new. Thus change cannot be a relation. Moreover it now appears doubly certain that change is substance. For first of all change is, as we have said, an event, and an event is a substance since it possesses characteristics and is not itself a characteristic.⁴ And in the second place a substance (to repeat) is that which possesses qualities and relations and yet is not either a quality or a relation. As we shall see change possesses qualities and relations and as the idealistic argument and the above argument show, change is not a quality and change is not a relation. Thus change actually does fit the form of reality that is called substance.

⁴ See, for instance, McTaggart, *The Meaning of Causality, Mind, N. S.*, vol. xxiv (1915), p. 326 ff.

(3) Finally, the assumption that change is substance can yield a coherent and a positive account of the nature of change. This account I shall try briefly to outline in the section below. In the meantime it may be noted that an account of change such as Mr. Bradley's not only is uncritical in that it ignores all but one plausible explanation of the certified fact of change. But it is also in the end inadequate and unhelpful in that it yields only a negative account of change. For really the Bradleyian account tells us only what change is not, that change is not a property or a quality of anything real, and it merely adds to this the warning that we may not insist that change is a property or a quality without degrading change to the rank of a mere appearance. Apart from this negative information, Mr. Bradley's account of change tells us nothing at all about change. When we ask of it, *what is the nature of change?*, it replies merely that change is something that appears to be a quality of realities but really it is not and it cannot be a quality of anything real.

The assumption that change is substance we say can yield a positive and a coherent account of the nature of change. In the following section I shall endeavor to state what this account of the nature of change is.

IV

Two difficulties stand in our way. In the first place, it has been said that substance is an empty and meaningless concept. And there is truth in this. Substance is indeed an empty and meaningless concept if by it is meant an unknowable substratum. That has been clear at least since Berkeley. But if substance is defined as that which possesses characteristics (qualities and relations) but is not itself a characteristic, then the concept of substance I think is full of meaning. There are two reasons for

this. In the first place, substance, as here defined, is an existent, if anything at all is an existent. This has been shown by McTaggart⁵ with great lucidity and skill and I can do no better than refer the reader to his proof of this. In the second place, substance, as here defined, being an existent, our definition of it is true, so substance has besides mere existence the characteristics assigned to it in its definition if anything ever has. Accordingly the concept of substance as used here not only refers to an existent if any concept does, but, since this existent has the distinctive characteristics other than mere existence assigned to it in its definition if any existent has, this concept contains a valid description of the nature of this existent beyond its mere existence. For these two reasons I submit that one could find no less empty and meaningless concept than the concept of substance as it is defined and used here.

The second difficulty may be stated in the form of a question. What anyway can you mean by change, we may be asked, if you do assume that change is substance? Aesthetically, I suppose, the most simple examples of change are instances of flow—the flow of a river, of the smoke of a cigarette, of the wind. Let us then take these examples as a clue to a comprehensive statement of the nature of change as substance. Each of these examples of change, it is observed, involves what might be called a “thing”—a river, a patch of tobacco smoke, the wind. And this I think is generally true. There is always some “thing” existent where there is change existent.⁶ An empty change or a change that involves nothing, is, I think, a mere fiction. Let us then define the total content

⁵ *Op. cit.*, vol. 1, bk. 2.

⁶ Provided of course the reader will be gracious enough to permit us to assume that persons and animals as well as rivers and air *and the like* may be classified for the purpose of the argument as things.

and nature of a thing, as it is at any moment—for instance, the total qualities, relations, substance, whatnot, of the river, the cigarette smoke, the wind, as they are at t —as a *state*. Then, in an instance of change, the occurrence of any state of a thing, if not the thing's last state, is followed by the occurrence of another and somewhat different state (*i.e.*, the total content and nature of the thing at t') and this, if not the last state, is itself followed by the occurrence of another and somewhat different state (*i.e.*, the total content and nature of the thing at t'') and so on. The occurrence of any one of these new states we will then define as a change and the occurrence of an unbroken series of new states we will accordingly define as a Change, and by change we will mean either a change or a Change or both.

Change so defined is substance. For it possesses characteristics (qualities and relations): *e.g.*, it has the quality of including a new state or a set of new states and it stands in the relation of inclusion to the new state or new states. And change here is not itself a characteristic or a quality or relation: nothing is here described as being or as having the quality of changing, nor is change described here as a relation of any sort. Indeed change here is described wholly as an event or as a series of events—as the occurrence of one or several qualified and related states of a certain sort. Accordingly change here is substance. It is not a characteristic, yet it possesses characteristics. And this is what is meant by substance.

By way of establishing more firmly and of amplifying sufficiently this account of the nature of change I will first of all consider three important objections that may be made to it.

(1) We have defined change in terms of the occurrence of states of *things*. But it may be objected, in the

first place, that an event as well as a thing has states and the occurrence of any new state of an event would therefore equally be a change. Thus, according to the position here, there would be instances of change that would not be instances of the occurrence of new states of things, and our definition of change, which limits change to the occurrence of new states of things, would therefore be inadequate and false. It might be further pointed out, as a second part of this first objection, that the occurrence of a new state of an event is itself an event, and since an event has new states, this event would have new states. And further, the occurrence of these new states would themselves be events and they would have new states, the occurrence of which would themselves be events, and so on *ad infinitum*. Thus our definition of the nature of change, according to this first objection, would not only be inadequate, in that it does not cover certain cases of change, but, if it should be expanded so as to cover these cases, it would commit us, at least in certain endeavors to denote change, to the torments of an infinite process. In reply to this objection we might proceed in several ways, but I think it is sufficient to observe that the assumption out of which the objection is constructed is invalid and false. The whole objection assumes that an event, like a thing, has or may be truly viewed as comprised of states. But this is certainly false. For a state is always a total which, like a state of a thing, is fixed and set. It is intrinsically devoid of the character of passage or of going-on. An event, on the other hand, is always a process, a transition, a going-on, and is never, *in toto* or in any of its actual experienced sub-divisions, fixed or set. In its minutest real parts it is a passage, a going-on. Thus the analysis made here of events into static slivers is essentially an analysis of events into what events never can be

and never are. It is false. And since this first objection is constructed entirely on the assumption that events may be analyzed into static slivers or viewed as comprised of states, it is also necessarily invalid and false.

(2) The above objection may however be rehabilitated. It may be pointed out that even if we do deny that events are comprised of states, we do admit that events have parts and may be validly viewed as comprised of parts. And thus it may be contended that the occurrence of a new part of an event is a change and therefore that change includes not merely the occurrence of new states of things as we say, but also the occurrence of new parts of events. I think there is truth and error in this objection. The objection is true in insisting that there is more than mere states of things involved in change. There are events. But in the main the objection is mistaken. For the objection supposes that a change can be the occurrence of a mere new event (a new part of an event is itself a new event), whereas a change, as I think, can never be the occurrence of a mere new or an empty event. An empty event is I think a creature of abstraction. It has a logical or conceptual, not an ontological or factual, reality. We can never experience, point to, or show decisively the existence of a mere or an empty event. Thus no real change could ever be the occurrence of a mere or empty event, as the present objection supposes. Indeed every real change, as I believe, may always be analyzed into (a) an event, and (b) a new state of some "thing." And it is in view of this that we have defined a change as the occurrence or the eventuation of a new state of a thing.

(3) A final objection may be made to our definition of change. It may be objected that our definition of change in terms of *states* of things is quite arbitrary and un-

needed. Why not define change in terms of the occurrence of a new quality or of the occurrence of a new state of an existing quality of a thing, we may be asked? Or why not define change in terms of the occurrence of a new relation of a thing or of the occurrence of a new state of an existing relation of a thing? Either of these definitions would be a definition of change as substance and should serve our purpose. The choosing of a definition of change in terms of the occurrence of new states of things therefore is quite arbitrary and superfluous. I doubt it. It is true that the occurrence of a new quality or the occurrence of a new state of an existing quality, is a true example of change as substance. But such examples would hardly enable us to map out and define change since the occurrence of a new relation or of a new state of an existing relation is equally a true example of change as substance but would be excluded from the list of changes if change were defined wholly in terms of the occurrence of new qualities or of new states of existing qualities, since a relation can not be reduced to a quality.⁷ On the other hand, our definition of change in terms of the occurrence of new states of things includes both of the above species of change, since the occurrence of a new quality or of a new state of an existing quality, or the occurrence of a new relation or of a new state of an existing relation, would mean that the total qualities-relations-whatnot of the thing at the time of the occurrence was different from the total qualities-relations-whatnot of the thing immediately prior to the occurrence. That is, the occurrence of either of the above types of novelty (the qualitative or the relational) would mean the occurrence of a new state. Thus our definition of change in terms of the occurrence of new states is neither arbitrary nor

⁷ The proof of our assertion that a relation cannot be reduced to a quality would be the same as that given by McTaggart, *op. cit.*, vol. 1, chap. 8.

unnecessary. It includes what is contained in the above two alternatives. It is required for comprehensiveness and it has been dictated by that requirement.

The above I think constitute the important objections to our account of the nature of change. Our general position, that change is substance, it is true, we have not called into question. But this position rests upon our proofs that change is not a quality and that change is not a relation and that change nevertheless possesses both qualities and relations. And this proof I think we have already sufficiently considered. With the above objections removed, I will, by way of rounding out and completing our account of the nature of change, consider two minor problems to which it gives rise.

(1) We should be clear as to (a) the relation between the events involved in Change, and as to (b) the relation between the states involved in Change. In both cases, I think, the relation is a kind, though a different kind, of continuity. In the first place, (a) there is continuity between the events involved in a Change. That is, the events in a Change occur without break, so that between the occurrence of any two immediately successive events in a Change there is in that Change, provided these events are immediately successive, no intervenient event. That is, there is there no occurrence of a third event. This definition of continuity is of course different from the orthodox or mathematical definition, according to which continuity is that property of a series in virtue of which there is always in that series a third term between any two. This difference I think is no objection to our own view. For the events of which we speak in our account of change are conceived to reside in nature as presented in actual experience, whereas the mathematical concept of continuity is never actually illustrated by nature as it is

presented in actual experience. Nature, so presented, you are never able to divide up into spatial and temporal parts which, within any experience, always have a third part actually between them. It is indeed only when you reduce presented nature to such entities as points without magnitude or parts and moments without duration or extent—*i.e.*, it is only when you reduce presented nature to infinite sets of abstractions, that you have terms to which the mathematical concept of continuity accurately applies. Thus our deviation from the orthodox concept of continuity is natural, not objectionable. Moreover I am inclined to think it is very advantageous. For the mathematical definition of continuity applied directly to the object-matter of actual experience, is beset with many difficulties.⁸ But these are so far forth irrelevant to the view of continuity stated here. (b) The states involved in change as well as the events so involved exhibit continuity. Each of these states, we have said, is the total content of a thing as it is at any given time. The continuity between the states involved in a Change refers to the fact that the content comprising a given state of a thing (S) contains something of the content comprising the immediately prior state of the thing (S'). Between these contents, that is to say, there is no complete break but a continuation. And this would be true even where one state in a Change appears quite different from its preceding state, as the state of a bomb at explosion appears quite different from the state of the bomb as it was when about to explode. Moreover, as a rule, two states in a Change that occur nearer each other in time, tend to show

⁸ For a few of these the reader may refer to the present author's article on causality in *Monist*, April, 1930, wherein certain deductions from the mathematical theory of continuity made by Russell and Bradley are mentioned and there is indicated the morass we encounter if we hold that the mathematical theory is valid for the object-matter of actual experience.

greater continuity of content than two that occur less near: the closer the occurrence of any two states in a Change, the greater, as a rule, is their contentual continuity.⁹ Such then is the relation between the states involved in a Change. It is a relation of continuity. This continuity differs somewhat from the continuity between the events involved in a Change. The latter refers to the fact that there is no break in the occurrence of the events in a Change, the former refers to the fact that there is no break in the contents comprising the states involved in a Change.

(2) Finally, we have spoken of events and states. change and Change, and we should be a bit more clear as to the relation of these. A change as we have said is the occurrence of a new state. That is, a change involves (a) an event, and (b) a new state. A Change, we have said, is the occurrence of a continuous series of new states. That is, a Change involves (a) a continuous series of events, and (b) a continuum of new states. This I think suggests the true relations between events and states, change and Change. A state or an event stands to a change, and a series of states or a series of events stands to a Change, in the relation of inclusion or ingredieny. As to the relation between the states and the events in change, it may be sufficient to indicate that one (the events) constitute the mere occurrence of change, the other (the states) constitute the contents, the what, above the mere occurrence, which has occurred. That is to say, the relation between an event and a state in a change, and between a series of events and a series of states in a Change, is the relation between a *that* and a *what* as this relation manifests itself in actual experience. How we should label this relation it may be difficult to

⁹ Cf. C. D. Broad, *Perception, Physics, and Reality*, p. 103.

say, but that the relation exists, is clear enough. Any change, for instance, may be analyzed into an event or a set of events and a state or a set of states, but it is evident to the analyst that the state and the event, the states and the events, exist in actual fact as bound together in a whole. The two exist in an indissoluble relation. What we should call this relation I gladly leave to the decision of a creative philologist. It is enough for our purpose to indicate the relation and to convey some idea of what it is.

V

Such as I think is the true nature of change. Change is always events of a certain sort—namely, the occurrence of new states of things. And its form as a reality is what is technically defined as substance.

In this article we first endeavored to determine what type of reality if any change is. That it is a quality as commonly assumed or a relation as sometimes contended, we had to deny. But we found, in part in this very denial and in part in the knowledge that change possesses qualities and relations, that change fits exactly that type of reality called substance. We then endeavored to define the nature of change as substance and to defend and expand this definition. Much it is clear remains:—certain broader issues involved in change—its relation to the uniform and to reality as a whole, for example—have not been touched. And such matters are important, although I think that because they are more ultimate they are hardly relevant to a re-orientative discussion of the topic such as ours. The urgent need is indeed I think to recollect that change is a fact and to see the problem of change as the task of discovering whether this fact of change can fit a form

of reality. The idealistic quest as to *what changes?* must be held to be indecisive and be removed from a central position, although at the same time the truth in the idealistic argument should be acknowledged and not ignored as it is in so much current writing on change where change is constantly assumed to be a property or a quality and mention of "changing things" and "changing relations" and so on clutter the pages. Indeed the truth of the idealistic argument might well be taken as a hint or guide and the problem of change be re-approached and re-formulated with this truth in mind. Such in any case has been our clue in this essay, both in defining the true problem of the nature of change, and in the discussion of change as substance.

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BACK TO DIALECTIC

I

ABSOLUTE idealism forms one vast arch of function spanning the nineteenth century; springing from the earth when Fichte denied the reality of the thing-in-itself of Kant; reaching its highest point in Hegel; coming to earth again in the criticism of the new realists, and the critical realists.

Only the generic aspects of the movement are to be considered in this discussion. Questions whether Hegel confined his dialectic to existence or conceived it as extending to all possibility, whether his specific categories are properly related to each other, whether his line of development of dialectic is the only line, are aside from the point. Likewise all interpretations of idealism as an effort to reduce the not-self to terms of the self do not concern us here—that particular reductive tendency is only one aspect of the general problem. Absolute idealism in its most general aspect is a doctrine of the constitutive character of relations, the gist of its teaching being that relations are internal to their terms. That signifies ultimately that the thing-in-itself in its perfect self-sufficiency is denied in the interest of an organic whole of reality. This is the strategic point where the controversy must center.

To those who have been once under the spell of the genius of absolute idealism there is usually little doubt of

the truth of this interpretation. Fichte, though still in the thrall of the *I* and the *not-me*, was concerned to reduce the different fields of Kant's philosophy to the terms of one common principle. The thing-in-itself, the theoretical reason, the practical reason, were to take their warrant from the nature of reality as a whole; the categories, instead of being accepted arbitrarily, were to be deduced from the undeniable postulates of experience. Though Fichte remained subjective to the end and retained irrational elements, he had started the movement on its course.

Hegel's philosophy was the triumphant completion of the undertaking. His criticism of the Kantian position makes clear his doctrine as usually accepted. Kant's system was dualistic and as such subject to condemnation. A fundamental defect in Hegel's eyes of every dualistic system lay in the fact that at one moment it unifies what has been explained at a previous moment as independent and unassimilable. If the thing-in-itself is considered as a limit that conception of it does not avoid the difficulty, for one knows a limit or defect only when he is above and beyond it. To call a thing finite or limited or imperfect is to imply the infinite and unlimited. In thus wholeheartedly condemning Kant as dualistic he is unreservedly taking his stand on the side of the doctrine of an organic whole of reality. In criticizing Fichte for substituting an impulse for Kant's thing-in-itself he is only moving further in the direction of the organic whole.

One wonders if in his doctrine of dialectic involving the principle of negation and contradiction with its thesis, antithesis, and synthesis Hegel has not restored the element of finiteness which was lost when the thing-in-itself was abandoned. If the contradiction involved in the thesis and antithesis were real and not merely apparent, each might be a thing-in-itself persisting as an

abstract identity even after the synthesis. This was an essential implication of Hegel's system but it is doubtful if either Hegel or his followers ever realized its full significance. Theses and antitheses, according to his doctrine, collapse without a remainder into the conquering synthesis; evil is only a disappearing moment, an illusion which belongs to finite spirits as such; and dialectic is a one-way street to reality. Even if *aufheben* may be interpreted as meaning *to preserve* as well as *to supersede*, the spirit of Hegel does not stress the preservation of the superseded contradiction in its identity as unassimilated. The stress is everywhere on the emergent synthesis. In other words, the real is the rational.

That Hegel's followers have clung to this doctrine in its essential features is too well known to need extended comment. Though Bradley gives a better logical justification for pluralism than do the pluralists themselves and comes nearest of all the absolute idealists to subscribing to that doctrine, even he runs true to form in exalting the Absolute. "Plurality and relatedness are but features and aspects of a unity."¹ "The character of the real is to possess everything phenomenal in a harmonious form."² "The Absolute holds all possible content in an individual experience where no contradiction can exist."³ Making still more explicit the idealistic position he says: "Being and reality are, in brief, one thing with sentience."⁴

Royce, not troubled with Bradley's logical difficulties, expresses himself with no hesitation. In his Fourth Conception of Being he says that God sees "the one plan fulfilled through all the manifold lives, the single consciousness winning its purpose by virtue of all the ideas,

¹ Bradley, *Appearance and Reality*, p. 142.

² *Ibid.*, p. 140.

³ *Ibid.*, p. 147.

⁴ *Ibid.*, p. 146.

of all the individual selves, and of all the lives." "We have no other dwelling-place but the single unity of the divine consciousness." "We are eternally at home in God."⁵ And the reasoning of the "Supplementary Essay," though more analytical, expresses the same idea. "Infinite variety is developed out of unity."⁶ "Internal variety is subject to" and "merely expressive of" "the single plan whereby, at one stroke, the absolute is defined, or rather defines itself, as a self-representative system."⁷ And again, he speaks of a "multiplicity of Individual facts that are still One in the Absolute."⁸

Principal Caird can find a solution of the problem of the relation of the mind to nature and of the finite mind to God "only by apprehending the Divine and the Human, the Infinite and the Finite, as the moments or members of an organic whole, in which both exist, at once in their distinction and in their unity."⁹ The true Infinite is "the organic unity of the Infinite and Finite."¹⁰ Again, the finite has no "independence or individuality which cannot be brought back to a higher unity."¹¹ And so we might continue through Bosanquet, and other outstanding followers of Hegel, but the general movement of all of them toward the Absolute needs no proof. In spite of logical detours all roads lead to that delectable mountain. What has been set forth here has been presented only to furnish a basis on which to develop the main thesis of this discussion.

Bradley displays, as before intimated, a variation of the idealistic argument which ought to lead to a supple-

⁵ Royce, *World and the Individual*, First Series, pp. 426-427.

⁶ *Ibid.*, p. 523.

⁷ *Ibid.*, p. 545.

⁸ *Ibid.*, p. 554.

⁹ John Caird, *Introduction to the Philosophy of Religion*, p. 229.

¹⁰ *Ibid.*, p. 231.

¹¹ *Ibid.*, p. 244.

mentation of his doctrine. He apprehends the necessary self-identity of terms, knows that they must nevertheless stand in relations and be assimilated into larger wholes, admits that he does not know how this can be done. Royce in criticism of him interprets all of his infinite regresses as self-representative series and insists that as such they are not self-contradictory. Bradley with his incisive study of relations must have seen that the terms in such series would, in order to occupy any place at all in the series, have to be identical with themselves and as such would present a logically unbridgeable gulf between themselves and the relations of the series.

As is well known, this position is made manifest time and again in his discussion of Appearance. It seems easy at first thought to make all relations internal to their terms and to conceive the universe as an infinite whole in which the parts mutually modify each other without limit. The less critical of the absolute idealists glory in this conclusion. Bradley, however, subjects this facile result to analysis. To take the most generic discussion, that on "Relation and Quality," "Qualities are nothing without relations."¹² A brief consideration makes this plain. if a quality is taken to stand out of relations the process of abstraction of which it is an end product persists and that carries with it a set of relations. Furthermore there can be no difference among qualities if there are no relations, for if the difference falls outside of any given quality, relation immediately asserts itself, and if on the other hand the difference falls inside of it we must distinguish within it itself and its otherness and we have then two qualities in relations. Thus we arrive at the conclusion of universal relatedness. That means that a quality is made by its relations. If it cannot be without

¹² Bradley, *Appearance and Reality*, p. 26.

relations, they and it form one indissoluble unit. If relations are conceived to be responsible for a part of a quality, then that part is responsible for a part of the residue of the quality, and so on ad infinitum. In this way the road is cleared for complete absorption in the organic whole of the Absolute. But that is not all. Qualities with relations are as unintelligible as they are without them. "*A* is both made, and is not made, what it is by relations."¹³ *A* must be identical with itself as different or there is no beginning of the accounting for the difference. Relations cannot precipitate terms that were not there before nor can they get on with no real differences beyond the mere ends of a line of connection.¹⁴ By this analysis Bradley makes impossible an easy assimilation into the Absolute.

After the analysis of quality and relation it is easy, as Bradley admits, to apply the principles there involved to other fields of experience. Space is not a mere relation, for it must consist of extended parts and these parts are spaces. These spaces are identical with themselves—they are somethings. But spaces being indefinitely divisible dissolve into relations. The same analysis applies to time. "If you take time as a relation between units without duration, then the whole time has no duration, and is not time at all. But, if you give duration to the whole time, then at once the units themselves are found to possess it; and they thus cease to be units." But there must be units or there is no duration.¹⁵ And regarding change, "Something, *A*, changes, and therefore it cannot be permanent. On the other hand, if *A* is not permanent, what is it that changes?"¹⁶ In short, the starting-point

¹³ *Ibid.*, p. 31.

¹⁴ *Cf. ibid.*, p. 32.

¹⁵ *Ibid.*, p. 39.

¹⁶ *Ibid.*, p. 46.

must remain identical with itself or the change has no measure and no direction, but on the other hand if it remains thus identical it does not change. Causation shows the same difficulty. If the effect is different from the cause what is the connection between them, and if it is not different from the cause nothing occurs. "*Causation must be continuous.*" "*Causation cannot be continuous.*"¹⁷ The gist of Bradley's dialectic is that identity

¹⁷ *Ibid.*, pp. 54-55, 60-61.

and difference, though each is reducible to terms of the other, yet contradictorily must retain their essential characters.

Indeed one may go farther than Bradley and show the same process of dialectic breaking out in the Absolute itself. The Absolute is, as he admits, nothing without its appearances. It is thus tied up in relation to that which taken as such is not the Absolute as such. As thus tied up in relation to something other than itself it is merely a quality in relation and suffers from the inherent dialectic of qualities and relations in general. If it be conceived as a mere limit of abstraction from which imperfection has been progressively removed, the process of abstraction itself survives and establishes relation between the rest of the world and the Absolute. And yet as a point of reference it survives identical with itself and inviolable. If it be maintained that the Absolute is so defined that it takes up imperfection as such into itself without a remainder, it must still be insisted that the imperfect as not yet taken up into the Absolute remains in some sense to specify the process of assimilation into it. The Absolute can have no character without the presence of its opposite. In fact the same arguments that were used against Spencer's Unknowable or non-relative, can be used against the infinite aloofness of the Bradleyan Absolute. The

Absolute is as necessary to the completeness of the universe as red or green or any other character and presents the same difficulties.

II

This leaves us at an impasse. The elements of the universe are unassimilable, even the ideal of assimilation being unassimilable, and yet they are all progressively assimilated. It is difficult to go with Bradley and admit that thought cannot make or accept differences, for apparently thought is only a high level of the very conflict which he has taken such pains to analyze. In fact if it is not that how can his analysis be valid? But it is also hard to go with Royce in his more optimistic theory of thought, for he seems not to appreciate the contradictory elements which Bradley has exhibited. The contention here presented is that the world is as full of contradictions as the latter believed and yet that, as the former believed, it can be thought. In one of the *Zusätze* of the smaller logic, Hegel states that "it is ridiculous to say that contradiction is unthinkable."¹⁸ Taking the cue from him we may accept the worst of Bradley's analysis and yet not find the situation hopeless from the thought standpoint. The existence of contradictory determinations in the same thing is no harder to accept than the existence of a non-contradictory thing. Neither can be thought except in a situation in which both are present as factors.

The suggestion of this discussion is that, while the principle of internal relations, the consequent assimilability of terms, and the reality of the absolute is accepted, there be added a doctrine of identities to take care of the contradictory but no less vital identity of the terms

¹⁸ *Smaller Logic*, Wallace's translation, p. 223, and his attitude is well known from numerous other passages.

that stand in relations. Such identities as we are advancing would come close to what Hegel would call abstract identities of understanding as distinguished from the type of concrete identity treated under the Doctrine of Essence. What we are trying to instate is the principle of identity as applied to anything whatsoever taken as such. It may involve the identity of a stage of causal process or that of a dream or any part of a dream or that of an error or an illusion or that of the wildest fancy or the identity of the absolute. Without such identities all change, from causal process to the flitting of attention, would lack specification and measure. They are different from the essences of Santayana in that they include the identities of existence—they are present in the flux. They may be subjective or objective, existent or subsistent, seen or unseen; they may span one moment or a thousand years.

Let us now examine what effect the addition of identities to absolute idealism has upon it. It insures that the emphasis which has always been placed on one limit of dialectic, namely the organic whole, is now placed on the process of dialectic itself. Synthesis loses its overwhelming importance as the "sublation" of contradictories and stands in equal partnership with thesis and antithesis. The synthesis has, it is true, all the assimilative power which has been attributed to it; as identical with itself in its own character it has overcome and wiped out the conflicting moments of which it is made; and the ultimate goal of synthesis, the absolute, has all the majesty that has been attached to it; but unless the lower categories maintain their identity as such the successive syntheses and the ultimate organism have no character as syntheses. Dialectic is no ghostly sublated wraith but the real battle of contradictories.

In keeping with this interpretation Nature is not

merely the absolute idea in the form of its otherness; it is at least that, but it is also *nature* identical with itself as nature, else the absolute idea would have no specification as the overcoming of nature. The abstractions, Being and Nothing, are not by definition so concrete as Becoming, but in the universe as a whole they are just as necessary as the more concrete categories. Action and Reaction in their alternation are more abstract than the pure self-reciprocation of the category of Necessity but in their character as such they are no less essential to the universe. Being and Essence (Hegelian) are as real as the notion. A great deal has been written about the necessity of the absolute for an intelligible world but the same thing can be claimed for every humblest existence or fancy. In fact, not only are we gifted by our doctrine with all the cogent reasoning of absolute idealism but we have an ontological pluralism beyond the wildest dream of the realist.

This is in fact a necessary condition for the working of the Hegelian system. As already intimated, dialectic had a definite place in the scheme: Hegel, though the absolute idealists failed apparently to realize its full significance, credits Kant with having presented the idea that contradiction is inevitable and essential. He then criticises Kant for teaching that thought or reason and not the world is the seat of contradiction. If attempt is made to save the reason from contradiction by confining contradiction to the categories of the understanding, he argues, reason becomes empty and indeterminate—it is saved from contradiction by the sacrifice of all its content. Neither the world nor reason can be saved from the inroads of contradiction. Furthermore, Kant did not make a complete study of the principle of antimony, according to Hegel, but limited it to four subjects taken

from the subject of cosmology. Antinomies in Hegel's view appear in all objects of every kind, in all conceptions, notions, and ideas.¹⁹ Every actual thing involves a coexistence of opposed elements. Consequently to know, or, in other words, to comprehend an object is equivalent to being conscious of it as a concrete unity of opposed determinations. Contradiction is thus universal.

Then as to the *drive* in contradiction. The emphasis that Hegel put upon "negation" is well known. "Contradiction," he says, "is the very moving principle of the world." Bradley in all of his discussion of contradiction finds cause for worry—it interferes with the solution of the problem of knowing—but he finds no movement in it. For Hegel there was a movement. Too often metaphysicians have thought that if they pushed the problems of the world back to a complete personal ground that would account for activity. The *drive*, according to the doctrine here sponsored, is inherent in the broader field which includes the as yet ungrounded as well as the ground. The effect of this shift of emphasis is to exalt the dialectic process instead of the absolute.

But if contradiction is to play such an important rôle it must be real. It can be no conflict by courtesy, it can be no flunkey who says "By your leave" to the absolute. Each thesis and each antithesis must be identical with itself, needing nothing outside of itself, deep as the universe, in fact it must *be* the universe. And yet, in spite of the fact that the universe requires that it be thus abstractly self-sufficient, it can be real only in the process of something happening, only in the process of its becoming something else. The doctrine of identities here presented is the only doctrine that can give the "sublated"

¹⁹ Cf. *ibid.*, sec. 48.

stages of dialectic sufficient reality to satisfy these conditions.

The usual thing in criticizing absolute idealism is first to realize that it does not do justice to the thing; then to realize the difficulty of knowing the thing, upon idealistic assumptions, if it does exist; and finally to adopt as much of idealism and as much of realism as seem to meet the several needs. Internal relations may be accepted in one place, as within the physical organism, while in another place, as in the knowing situation where internal relations would obviously modify the thing out of existence, external relations are adopted. This plan yields only a set of mechanical devices, and, at best, requires something outside of the machine to make it go.

If relations within the organism are assumed to be internal, it becomes immediately apparent that the terms related, though they be as intimately connected with the rest of the body as are ganglia and ductless glands, are something in their own character or the body loses all distinction within itself and collapses. The supposed internal relations must, then, at the same time be external or they cease even to be internal. Take, on the other hand, the assumed external relations in which a thing coming into the knowing situation is supposed to stand. Are we then to ignore all the differences in perception that come from differences in the perceiving organs, differences in apperceptive mass, in psychological set, in mood, in temperament? The strain upon credulity which this requires is too great. Then what is left? To take relations, on the one hand, as universally internal, absorbing all things ultimately into the absolute. The thing, error, evil, all things earthly, are then illusion. The only real from that viewpoint is the unalloyed joy of pure functioning or pure form freed from all taint of matter. This

must be accepted with passionate conviction. On the other hand we must take relations as universally external. All finite things, the flesh and the devil, as well as God and his angels, are real in themselves: they are not created by relations; they form an infinite discontinuum of identities. Both sides are real, the absolute of the absolute idealist and the identities of the realist. And the *drive* of the world is transferred from God to an immanent dialectic.

The phenomena of the empiricist, the thing-in-itself of Kant, the *Anstoss* of Fichte, the entities of the realist, and the Absolute of the Hegelian idealist have all the reality that has ever been claimed for them by their exponents. The searcher after truth will take no cross-section of nineteenth century thought but will embrace the whole movement from Kant to the recent realists with all their irreconcilable antagonisms. Nor will this mean that order will be banished from the world, for the polarity involved in these oppositions is orderly.

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INFINITY AND INDEFINITENESS

I

INFINITY was a much glorified concept until Hegel directed his pen against it. Prior to Hegel the meaning of infinity was inseparable from the meaning of eternity, as the sun's rays are inseparable from the sun. Infinity was the halo of eternity.

But at last this notion of infinity was disparaged. For Hegel labeled mathematical infinity "bad." It is true that he opposed to this "bad," or quantitative infinity, a "good" or qualitative infinity of the absolute. But the latter is practically equivalent to eternity. It is infinite in the sense of transcending and yet being presupposed by any finite entity. But it is a totality in itself and thus definite. It is well symbolized by the infinity of a circle which is a closed totality in opposition to the unending straight line which simply has lost its end. Linear infinity is then an image of the "bad" numerical infinity.

The lamentable rôle assigned to infinity on the stage of Hegel's philosophy was, no doubt, due to the contemporary definition of infinity, which was negative. An infinite number was defined before Cantor as a number which exceeds any assignable number. This definition implies an endless series of numbers. For no matter how great a number is assigned, one can always progress further by adding one. Hence the situation is essentially

indefinite. It indicates a possibility of advance. It does not indicate a numerical series as a totality, but is, as it were, a series in the making accompanied by a conviction that it will never be made.

It is "bad" because to venture on the path of numerical infinity would mean to enact a kind of mathematical Wandering Jew. The indefiniteness of that endless wandering makes it a philosophically unreliable and worthless concept. For it is an entity with shifting boundaries. Its vagrant nature is, accordingly, a source of ambiguities and paradoxes. Hence to handle it in a logical way successfully would be impossible.

Thus infinite number was condemned and scorned. But unexpectedly an appeal to mathematics reversed the judgment. It was Cantor who advanced a new mathematical definition of infinity which is positive and, furthermore, appears to correspond to what Hegel would have qualified as the demands of the "good" infinity. The new definition states that an infinite number may be defined as *the number of any aggregate that includes a proper part numerically equal to itself*.

In the first place, this definition may pretend to philosophical significance because it is expressed entirely in positive terms. Secondly, it appears to have exactly that miraculous trait which characterizes Hegel's absolute: i.e., an implicit presence of the whole in its parts.

This being the case it is no wonder that logicians and philosophers have welcomed the new definition. I understand that in the field of mathematics its application has proved fruitful and justified. But the enthusiasm of philosophers and the success in mathematics does not dissipate my doubts concerning the significance of the new definition.

Of these doubts the principal is that the new definition

is only seemingly positive, but in fact conceals within itself the old indefinite endlessness. That is to say, the new definition is intelligible only on the assumption of endless series.

In order to substantiate this doubt I shall try to show, in the first place, that the one-one correspondence which establishes equality between an infinite whole and its proper part would not be possible unless the series compared could be indefinitely increased. Secondly, the possibility of an indefinite advance is the only actuality so far as infinity is concerned. There is no actual infinite totality. The latter is an illusion arising from the illegitimate confusion between "any" actually assignable number of an indefinite series and "all" its members. This "all" is an imaginary entity.

The answer to this objection to the effect that "all" can be assigned *intensionally*, though it eludes any possible enumeration, leads to a short discussion concerning the relation between intension and extension, the outcome of which indicates that the new definition of infinity obliterates the distinction between intension and extension and, consequently, is unjustified in the appeal to such a distinction. For it turns out that the mathematical definition of infinity depends on the extension of the latter.

This point is of considerable importance and not only because of the blow to mathematical infinity. It has a positive significance; it suggests that the meaning of infinity lies in all cases in which intension entails extension. Such cases are found in the relationship between the levels of universals and particulars. More specifically, it is the relation of *recurrence* because this relation, in order to be intelligible, demands not only a universal character, but instances of its embodiment as well.

In view of this situation I advance a conjecture that

infinity denotes a recurrence, i.e., infinity translates a universal in terms of particularity. Since, however, the levels of universals and particulars are forever distinct, an adequate translation is impossible. According to an Italian saying all the translators are traitors. And the treachery of translation is betrayed by the essential indefiniteness of infinity.

These points are expounded more fully in what follows.

II

There are, of course, many different illustrations of the new definition of infinity. But for my purpose it will suffice to consider one. I take the most familiar case of all, the integers set in one-one correspondence with all the even number thus:

Case I A. 1, 2, 3, 4, 5. . . . n,.....
 B. 2, 4, 6, 8, 10. . . . 2n,.....

The series B is only a part of the series A, since it leaves out of account all the odd numbers. Yet this part is equal to the whole because the two rows are set in one-one correspondence. Now it is assumed that one-one correspondence is the criterion of equality. Accordingly, inequality would mean either one-many or many-one relation between the members of two collections. Hence it follows that the one-one correspondence in order to establish equality must *exclude* the one-many and many-one relations.

This condition is important in our case of two infinite series, for it raises a doubt as to whether they can be arranged in one-one correspondence. Let us consider the logical implications of the condition of equivalence. The question is this: How is it possible to secure the exclusive one-one correspondence between the members of two collections?

The answer gives two possible alternatives. There may be a natural correspondence so that any member of the first series would not tolerate the company of any but one particular member of the second series.

This is a case of what Mr. W. E. Johnson calls *factural correspondence*. The one-one correspondence which holds between husbands and wives in a monogamic society may serve as a typical concrete example of the factural correspondence.

The second alternative is the conventional assignment of a corresponding member of a second series to each member of the first series to the exclusion of all other assignments. This is in Mr. Johnson's terminology a *factitious* correlation, i.e., "not inherent or objective, but arbitrarily imposed by the counter."¹ Factitious correlation takes place in counting, where the order in which the items to be counted is irrelevant provided each number is applied in the ordinal succession to one item only. Besides the case of counting, a factitious assignment occurs whenever there is a demand for a correlation between *finite* groups which are not naturally or internally interconnected. "Apart from this *factitious* coupling, there is no one-one relation, subsisting between any item of the first set and any determinate item of the second, that would not equally subsist between the given item and any *other* item arbitrarily selected from the second set."² In other words, both sets must be artificially arranged prior to the coupling of their items. And, of course, they must be finite in order to be thus treated.

A factitious correlation deals with finite collections because it is based on enumeration or counting. Infinity evades enumeration. Hence a factitious correlation is

¹ W. E. Johnson, *Logic*, Vol. II, p. 156.

² *Ibid.*, p. 159 f.

impossible when infinite groups are concerned. It follows as Mr. Johnson expresses it, that "the only mode of establishing numerical equality between *infinite* classes is to discover *factual*, or more specifically *formal*, correlations."³

But if there is no factual correlation between finite collections, why should infinite classes be in a privileged position? To be consistent Johnson should have applied to infinite collections the same consideration which he maintains concerning the finite sets, i.e., that there is only a conventional basis for coupling two items which belong to different sets.

If Mr. Johnson refuses to hold to this concerning infinite sets, it is because he has admitted already that they cannot be correlated factitiously. Were he to concede now that they cannot be correlated factually either, it would follow that they are not correlated at all. But this is not conceded because it destroys the supposed equality between the whole infinite series and its proper part.

Thus the assumption that there is a factual correspondence between infinite sets seems to be advanced *ad hoc* and without any warrant. In fact, as it happens, infinity is not only not in any better case than finite collections in respect of a factual correlation but is in a decidedly weaker position. For infinite sets have no means of excluding the claims for one-many or many-one correlations, an exclusion which is possible in the equalizing of finite collections because of the actual exhibition that each unit of a given set has one and only one correlation of another set. Such an actual exhibition of correlation between two infinite series is impossible. Their correlation is only a rule or requirement to be correlated in a certain way. But then there is no definite reason why one rule of correla-

³ *Ibid.*, p. 156.

tion should be preferred to any other. And because of this indefiniteness it may appear that two infinite collections are at once in one-one and in one-many correspondence. In other words, they lack the condition of uniqueness of a one-one correspondence which alone could guarantee equality. Since they can be arranged both in one-one and one-many correspondence *they lack the factual correlation*. Since they cannot specify their order of arrangement *they have no factitious correlation either*.

But is it a fact that two infinite collections may be arranged both in one-one and in one-many correspondence? In answer to this question I would refer to Mr. R. H. Dotterer's argument.⁴ Mr. Dotterer proposes to consider the same two series that were exhibited above as in one-one correspondence correlated differently as follows:

Case II	1,	2,	3,	4,	...
	2, 4,	6, 8,	10, 12,	14, 16	...

Mr. Dotterer says that this one-to-two correspondence is "... determined by clear and definite rules of exactly the same kind as, although a little more complicated than, the rule which determines the one-to-one correspondence. In case II let the rule be that the second of the two terms paired with any one term of the whole series shall be four times that term. . ." It is shown next that different other correlations between the two series are possible. Hence it follows "... that the whole series stands to this proper part in these *various* relations of correspondence *in exactly the same sense* in which it stands to it in the relation of *one-to-one* correspondence."

This then disproves the factual equality of infinity to its proper part. Since the *factitious* correspondence has been denied *ab initio* the whole basis of the new mathe-

⁴ Cf. "The Definition of Infinity," *Journal of Philosophy*, Vol. 15, 1928, p. 294 f.

mathematical definition of infinity collapses. What really takes place is not *the* equality between the whole and its part but any correlation whatsoever or, what amounts to the same thing, in themselves the whole and the part do not stand in any correspondence whatever. The protean trick on the part of infinity in assuming various sorts of correspondence proves nothing but *indefiniteness*.

And the reason for such indefiniteness is obvious. There is no end, in the direction to the right, of the infinite series concerned. Accordingly this direction indicates an inexhaustible supply of fresh numbers. And because the supply is inexhaustible any sort of correspondence to a given series may be established. For one may always draw new numbers to be set in correspondence either individually or by couples or even wholesale. The borrowing of these numbers never brings the source of supply to an end. Infinity is a hydra. You think you cut off its head, but you are mistaken. A new head grows in place of the old one.

Thus if different correlations (including the one-one correspondence) may be imagined between an infinite collection and its proper part, it is because the *endlessness* of the series concerned is presupposed. Hence the new definition of infinity cannot get rid of the old negative definition, but tacitly involves it. This is the first conclusion of the present paper.

III.

In spite of the preceding argument a partisan of the cantorin infinity may insist on the possibility of *neglecting* all the correlations but one, namely, that on the basis of which there is a one-one correspondence between the in-

finite whole and its part. But is there such a correspondence, after all?

In order to answer this question affirmatively one has to maintain that there *actually is* an *infinite whole* as well as an *infinite part*.

These two infinite rows of a whole and of its part must be imagined as running parallel to each other so that one can pick up any item of the first row and find at the same time the corresponding item of the second row. These two organized armies of numbers, which are facing each other and waiting patiently to be called forth, offer a curious picture of which there is in my judgment no original in actuality. And the armies of these ghosts, even if their number were infinite, would make, in the estimation of a militant logic, a negligible quantity.

That such infinite rows are fictitious is proved by the fact that actuality displays only finite entities. Actuality may even be defined as a limitation of the realm of possibilities. And limitation means finitude. But the justification of this definition of actuality would lead beyond the scope of the present essay. It suffices to point out that besides a meeting of finite entities all that actuality exhibits is an indefinite possibility of proceeding towards new finite entities. And this is exactly the meaning of the indefinite or negative "infinite": i. e., the possibility of advancing beyond any assigned entity to other entities. It does not follow by any means that such an indefinite is actually infinite.

Sometimes, however, the fallacious inference is made that the possibility of an endless advance implies an actual infinity. The famous "locus" of such an inference is, of course, Lucretius's proof of the infinity of the world in space. If the world were finite one could imagine a man on the edge of the world throwing a dart forwards. And

since there is no obstacle to the flight of the dart, the latter will move beyond the supposed limits of the world. Which proves ipso facto that these limits were not real limits.

The argument evidently identifies the possibility of advancing beyond any actual limit of space with the actual infinity of space. But such an identification is by no means necessary.⁵ The advance beyond the limits of the world does not prove that these limits were unreal. It proves only that they may be removed along with the flying dart. In other words, the flight of the dart creates a new actual space. For space, in general, may be considered as the function of the interactions in this world. And there is no reason why the range of the interactions should not increase in the course of time. The world growing older may well expand in space.

Of course, that creative motion of the dart presupposes a possibility of motion, i.e., a possibility of space. But this possibility should not necessarily be imagined as an actual *empty* space spread ad infinitum. An empty space is a pure fiction. I do not mean that the possibility of space is nothing, but that space is not empty. For space, in order to be space, must be actual, i.e., filled up with real entities.

The reason for this is as follows. Space is something which has spatial characteristics or entities, such as points, lines, volumes and so on. But a spatial entity cannot properly be characterized actual unless it is actually exhibited. And that actual exhibition is always an outcome of some interaction in the concrete world.

Let us take, as an illustration, the simplest spatial entity—a point. Now, it is clear that a point is actually exhibited at the intersection of two lines. But the question

⁵ Of course, in respect to a non-Euclidean space Lucretius's difficulty might not have arisen at all.

is whether or not this point actually existed before its exhibition.

In any case it must be granted that an invisible existence on the part of a spatial entity is a queer mode of being. Such a spiritualistic status could not be explained even by playful reasons. For even if all the points along a line were playing "cache-cache" that would imply the possibility of finding them all.

But the curious thing is that they cannot all be found. In order to find two or more points one has to separate them by a linear interval. In general, if a point is found it is because its surroundings appear to be different from points. The prerequisite of a point is the intersection of two *lines*. But even if the intersecting line moves continuously parallel to itself, it will not continuously exhibit new points along the intersected line. For the continuity of motion will leave no linear interval between the points and they will, so to speak, blend together. Thus all these points, when unveiled make only a cemetery of points. In fact, they make up the intersected line itself. Of course, it does not follow that the points blended together into a given line are nothing at all. One does not create a point from nothing by intersecting a line. But it follows that before the intersection takes place the points are not actual entities, for they are not yet individualized. An actual point is an individual emerging from the state of fusion with other points. It is a selection, which presupposes that the neighbouring points are, as it were, neglected and suppressed.

The possibility of an entity, which cannot be called nothing, and yet is not an actual being either, may be demonstrated in the realm of time as well as in space. The events of the future are precisely in this predicament. For

one cannot flatly deny the future. Mr. Broad's failure in maintaining the nothingness of the future is sufficiently instructive. It shows that in a sense the future must be given and, consequently, the totality of time, though neither the future nor the totality of time is given in the same mode in which an event may be *actually present*. If this last were the case the advance of time would be impossible. Everything being present, it could advance nowhere. In other words, though *any* event may occur sooner or later, not *all* events can occur in the sense of an actual happening. If they could, time would commit suicide! Thus *all* events are not actual; they simply indicate the possibility of *any* actual occurrence. One must guard against the confusion of "all" and "any."

This last consideration is particularly relevant to the problem of correspondence between infinite collections. It seems to me that an analogous confusion between "*any given*" and "*all possible*" members of a series takes place when the one-one correspondence of an infinite whole to its part is contended for. Returning to Case I, the functional correlation of "*any*" number in the row A, with some even number in the row B cannot be extended to "*all*" numbers, for that would presuppose the question at issue, viz., the totality of numbers. Of course, it is true that any *given and finite* member of the series of integers may be coupled with an even correlate of the row beneath. This is possible because one can actually proceed beyond any assigned number. In other words, it is possible because there is no completed totality of numbers. The Aristotelean conception of endlessness is decisively important here. If there were a greatest number, we could not find its double, since the greatest number would close the series.

Thus any integer finds an even correlate because it is

finite and, consequently, does not close the aggregate of units. Now it is certainly true that if any given, i.e., actual and finite number has an even correlate then all *given* numbers also can be set in one-one correspondence to even numbers. But it does not follow at all—and this is the most important point—that if any actual and finite number has an even correlate then all *possible* integers have even correlates. For, as I suggested above, the state of possibility of entities is different from the hiding of actual entities. And to treat all possible numbers as if they were actual entities, though not yet revealed, would be a fallacy. At least, it certainly would be a confusion of types to treat the whole class of numbers in the same way as its members.⁶

Undoubtedly the property of having a double correlate is a functional property. And this functional property is hereditary. But only inductive or finite numbers possess hereditary properties. The infinite class, on the contrary, is *non-inductive*, according to the partisans of the new definition of infinity themselves. That is to say, infinity escapes the hereditary burden of a progression, in which a hereditary property is carried from one member to the next. Infinity “has no immediate predecessor, because there is no greatest finite number.”⁷ Therefore infinite number is free from any obligation to mathematical induction. But then the property of one-one correspondence which may be extended to any assignable or finite number of a series cannot be attributed to an infinite number.

In other words, the very application of the rule of one-one correspondence is based on the inductive character of the series and does not take place when infinity

⁶ Cf. *Principia Mathematica*, p. 37; “Whatever involves *all* of a collection must not be one of the collection.”

⁷ Russell, *Scientific Method in Philosophy*, p. 195 ff; *Intr. to Math. Philosophy*, p. 80.

is concerned, since the latter is by definition non-inductive. It follows that one-one correspondence cannot be established between infinite series for they are not actually assignable.

IV

In spite of the fact that infinity is not enumeratively or inductively assignable, the cantorians maintain that an infinite number may be assigned in *intension*. Thus Mr. Russell holds that “. . . there is only one practicable way of defining particular infinite classes, namely by intension.”

The practicable character of a definition by intension consists in the fact that it may dispense with the enumeration of the instances of the entity to be defined. But an important proviso must be added: this is true only so far as finite entities are concerned.

It must be true concerning finite entities, for otherwise the latter would be unintelligible in the case of an indefinite or of a null number of instances. For example, connotative definitions may make intelligible the notions of “atoms” and of “dragons,” though the former are innumerable and the latter are non-existent. The number of instances is simply irrelevant to the intelligibility in *intension* of a finite entity.

This is true even as regards finite numbers themselves, at least on the basis of the class theory of numbers. But if one turns to the definition of infinite collections one finds the situation puzzling.

In one sense the Cantorian definition of infinity is clearly enough given in intension; the whole infinity is discriminated from its parts. In Case I above, for example, the second series obeys the general rule of leaving out the odd numbers; hence it is a priori a part of the

complete series of integers, including both even and odd members. Thus the part-whole distinction between infinite collections can be established in intension.

But the other demand of the definition, according to which the whole and the part are set in one-one correspondence cannot be demonstrated in intension, since it is based, as I have shown, on an enumerative or inductive coupling of any finite number with its functional correlate. It cannot be demonstrated in intension because by definition in intension a whole is greater and not equal to its part. Hence in order to show that this definition in intension may have an exception one has to recur to an actual exhibition, i.e., one must show the exceptional case in extension. In case of infinity the definition in intension must itself refer to an exhibition of actual endless series.

This exhibition, roughly speaking, takes place in the following manner. First, one imagines a diagram of a whole-part relation, which is, in accordance with the definition in intension, an inclusion of the part in the whole: Next, one recalls that the *endlessness* of the part precludes its having rigid or permanent boundaries. The radius of its circle is perpetually increasing so that its swelled boundary may, so to speak, catch up with the outward circle of the whole. Hence the equality of the part to its whole is proclaimed. To be sure, the whole can swell up in its turn. Yet it can be overtaken again by its growing part. There is then a *process* of shifting boundaries. The part is equal to the whole in the making, but not to the whole ready-made. If the definition in intension indicates this kind of "equality," then it is only a rule according to which an actual endless series may be constructed. But such a rule of constructing is essentially different from a connotative description of an already con-

structed entity. The latter being a static system may be described. But in the absence of fixed boundaries the description of the situation would be similar to a description of a face which has no features. If a rule of constructing a series is interpreted as a description in intension of a completed series, then the rule is violated because there is nothing to construct.

To illustrate this let us consider Russell's example of a state, where polygamy and polyandry are strictly prohibited. This means that by definition in intension the number of married men is exactly equal to the number of married women. That is to say, inequality is positively ruled out *a priori*. However, imagine that the number of married men and women is infinite, which is not impossible *a priori*. Then on the basis of the Cantorian theory one might select all the wives and put them in one-one correspondence to all the members of the married couples. It would appear that there are two women corresponding to each married woman. A series of surplus women would be, as it were, miraculously created. This curiosity might be approved by men but it would certainly overthrow the constitution of the state.

The absurdity of the situation shows that operations with endless series defy a definition in intension. For a definition of collections by intension either indicates an equality or a whole-part relation (i.e., inequality) but not both. Hence if we grant for a moment that endless series are at once equal and unequal, either equality or inequality must be established in extension and not in intension. In fact, as shown above, equality is established in extension. And this consideration solves the intolerable paradox of the new definition of infinity. The infinite whole and its proper part are equal and unequal in different senses.

The logical fallacy of the cantorians lies in the confusion between infinite *totalities*, i.e., entities in intension and endless *series* unfolded in extension. It is true that the indefinite series which leave a possibility of an endless progress were actually exhibited. And no matter how different in intension these series were, they all presented an equality in the sense of the endless extensibility.

But this endlessness, which really means an absence of totality, was mistakenly interpreted as an equality of totalities defined in intension. That mistake becomes apparent, however, because the proposed definition in intension is unintelligible unless an indefiniteness in extension is presupposed. For by definition in intension a whole is *necessarily* greater than its part and to maintain an exception it is *necessary* to recur to a different kind of demonstration, viz., to extension.

Thus it turns out that whenever one treats infinity in intension one must exhibit an actual case of endlessness or indefiniteness. And this may be taken, in my opinion, for the basis of a definition of infinity. That is, *infinity may be defined as a collection which has an intension dependent on the extension*. This definition distinguishes infinity from all finite entities.

And it appears also that it is couched in purely positive terms. In fact, however, it is not so, because in order to be understood it *leads* to an actual demonstration of an instance of endlessness. Yet there is at least one advantage in the proposed definition over the Cantorian. My definition only *leads* to an exhibition of endlessness, whereas the Cantorian *presupposes* it.

This advantage is due to the fact that the concept of intension in itself does not present immediate evidence for the independence of extension in the case of finite entities. This independence must be established mediately. To

illustrate this one has only to recall the endless controversies concerning the status of Universals.

On the other hand, the Cantorian definition is based on the violation of the generally admitted meaning of the "part-whole" relation. And since this violation amounts to a violation of the logical law of excluded middle (interpreted in extension), the Cantorian definition could be discarded *ab initio*, unless it *started* with an exhibition of an actual case of such a violation. It follows that the Cantorian definition *presupposes* endlessness.

V

I do not claim that my definition has any significance in mathematics. Apparently the Cantorian definition satisfies the mathematicians and, therefore, must be retained as an operative and pragmatic instrument. But I think that my definition may have a certain philosophical importance. For it leads to a search for those cases where intension implies extension. And once these cases are found their logical conditions may be investigated. Hence the possibility of clearing up the situation which involves infinity.

The present essay cannot undertake an explanation of infinity because that would require lengthy discussions. All that can be done here is in the way of suggestion and conjecture.

With this preliminary remark in mind let us, in the first place, turn to the most familiar illustration of infinite series, viz., the infinity of points on a line. The fact that all lines, no matter how short or long they are, possess infinities of points is supposed to illustrate geometrically that in infinity a part may be equal to the whole.

But it is overlooked that the inequality or part-whole relation is concerned in these illustrations with lines and not with points, whereas "equality" concerns the number of points. Accordingly, it does not follow that inequality of lines entails inequality between the collections of points. This would be the case if the length of line were built up by accumulation of points. But it cannot be so for the simple reason that length is a dimension, whereas points are dimensionless. Since all points have a zero-dimension it is clear that even an infinity of points would yield nothing but zero length.

Hence when unequal lines are compared as to the "equal" number of points that they contain, this comparison loses sight of the lines as such. A point is a cut on the lines. And, of course, one may cut any line as long as one pleases. But thus cut, the lines are mutilated and, therefore, falsified. In other words, the endlessness of the series of points is revealed only when one descends from the level of linear dimension to the level of zero-dimension. In terms of the former the supposed equality of infinite collections can never be demonstrated.

It will be easily found that the same may be generalized as to any dimension of space. That is to say, on the level of a certain dimension its unequal sections cannot be equal. It is only in the language of the lower dimensions that these unequal sections may appear to contain an infinity of constituents.

This necessity to lower the dimension or to descend the ladder of levels in order to encounter endlessness is analogous to the necessity of translating intension in terms of extension which I hold to be characteristic of infinity. And the analogy may be pushed one step further. The level of intension is, so to speak, of a higher dimension than the level of extension. For just as a geometrical

entity of a higher dimension runs through the geometrical entities of a lower dimension and yet *transcends* them all, so a meaning in intension is exemplified by all the entities making up its extension and yet *transcends* them. The reason for the latter transcendence is that intension belongs to the level of universals, whereas extension deals with particulars.

I call attention to this point, because I think that it suggests a generalization concerning the meaning of infinity. That is, I think that infinity may be explained by the relation (or rather operation), which makes up the connection between the levels of universality and particularity. Whenever the attempt is made to express a universal in terms of particulars an endless or infinite way is open.

A universal is not, like a particular, confined to a definite spatio-temporal spot. A universal is able to perform what Cagliostro once claimed to have achieved, i.e., a simultaneous appearance at different gates of existence.

On the other hand, the particulars must have a "make-up" for such ubiquity, if they are to translate universality in their own language. But the only means to do this would be to annex new regions of space and time, at which a universal might appear. This expansion in space and time is achieved by an *accumulation* of particular instances. The plurality of instances is thus, as Plato has noted it, an imitation in terms of number of the universal plan.

In so far as this imitation is skillfully done what takes place is the *recurrence of a universal*. Recurrence is, indeed, the connecting link between universality and particularity. For recurrence, in order to have a meaning at all, *must be actualized*. If nothing ever recurred, then the very conception of recurrence could not arise. By a

peculiar ontological argument, recurrence leads to particular recurrent occasions.

On the other hand, universality is also subject to recurrence. For a concrete occurrence is distinguished from recurrence precisely because the latter is a particular occasion *plus* an element of universality, which repeats itself on many occasions. Hence recurrence implies universality. And the reverse is also true: universality implies recurrence. I am not denying that a universal is indifferent to the frequency and location of its manifestations. I agree with Whitehead that a universal is externally related to the concrete occasion. But this indifference or externality should not be extended too far. Though a universal is externally related to *any* particular instance, it does not follow that it is externally related to *some or other* manifestation. A universal must be exemplified sometimes. Otherwise, as a pure abstraction, it would lack any actuality. If it did not actually recur at different occasions, there could be no reason whatsoever to distinguish its uniqueness from the uniqueness of the particular.

The plurality of repetitions is, then, the way to express in number or in extension that which is essentially unique and intentional. Thus recurrence is the source of number. But it is not the source of finite number only. For it involves endlessness and indefiniteness. And there are two reasons for this. The first lies in the nature of universals. As already observed a universal is externally related to any particular occasion and yet is compelled by "recurrence" to take place in some instance or other. In order to make the conjunction of these two conditions possible, "recurrence" must present an inexhaustible and unlimited field of manifestations. That is, the freedom of selecting an incarnation cannot be restricted.

The second reason is the ontological difference between the levels of universality and particularity. Though recurrence is a medium, there is no perfect communication between the two. For the plurality of instances always falls short of the uniqueness of a universal. The accumulation of particulars may imitate the catholicity of universals, and yet the imitation is never perfect.

And this fact that there are ontologically irreducible levels—is, perhaps, the meaning of infinity. It does not express an actually infinite series. It simply shows the impossibility of translating one ontological level in terms of another which lacks some formal element of the first. The lacking element is in vain replaced by an endlessness of efforts to reach its universality.

The universal cannot be crucified on a finite cross: it is resurrected in recurrence.

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FRANCIS BACON AND THE MODERN SPIRIT¹

RECENT psychology and educational theory manifest tendencies to assume as well as to conclude that the self is an aggregate of affective-motor dispositions and habits, each of which exists in essential independence from at least some of the others. The task of character education is then construed as the cultivation and training of separate interests in such wise as to add virtue unto virtue. Man's moral nature is viewed as a composition of relatively distinct virtues. In contrast hereto are the more monistic doctrines of man and of morality. These have taught that all the various virtues spring from a single root. They have contended that excellence of functioning in man's diverse relations to physical and social situations reflects a single spirit. Thus, the Cynics held that virtue is essentially one and is entirely comprised in wisdom, that every act of the wise man is in accordance with all virtue. So also the Stoics taught that he who has one virtue possesses them all. Earlier still, indeed, the father of scientific ethics himself had defined virtue as knowledge, and had described the several virtues in terms of valid insights into the nature and the significance of the various demands upon human action. Nor has the theory of the unitary character of the moral life lacked advocates among the modern ethicists of western Europe

¹ Read before The Baconian Club of The State University of Iowa, on March 28, 1930.

and America. William Wollaston, for example, attempted to demonstrate that truthfulness is the central principle of all good conduct; and, in our own day, America's most erudite philosopher, Josiah Royce, argued with fervor that the heart of all the virtues is that willing, practical and thorough-going devotion to a cause which might fittingly be called loyalty. In essential agreement herewith, a distinguished member of this Club, in the introductory chapters to his valuable series of volumes on *A Guide to Literature for Character Training*², has declared: "There is just one sin, that of selfishness. All the blemishes, little and big, root down in that." When we look aside from technically equipped moral philosophers and yet do not leave the ranks of profound seers, we find many who would subscribe to Carlyle's dictum that a carpenter might quite possibly break the entire decalogue with a single stroke of his hammer.

But even if we accept an organismic doctrine of the moral life of the individual, may we do the same for the complex civilization or culture of an epoch in a broad area of the world? Is it defensible here to speak of an animating spirit or operative principle that manifests itself throughout the diverse human interests and institutions and the various lines of social endeavor and evaluation? Perhaps the meaning of these questions would be clarified and a suggestion given for their answer if we were permitted the use of an anecdote—one which need not arouse scientific suspicion merely because it involves an element of humor. It is said that a teacher in an institution including students of many different nationalities once prescribed an essay on the elephant. From a sturdy, self-reliant English lad recently returned from vacation she received, in due course, a paper entitled "Hunting

² Vol. I, p. 7.

Wild Elephants in Africa." A somewhat cocky, red-headed Irish boy, on the other hand, prepared an account of "The Fighting Elephant," while a polished and courteous French pupil, after a visit to the parks of Paris, submitted as his theme "L'amour chez les éléphants." A dreamy-eyed and somewhat mystical Russian who had meditated at a boulevard cafe presented his reflections on "The Ideal Elephant"; an industrious and spectacled German student, after numerous visits to the zoo for careful anatomic measurements, and after repeated journeys to accessible libraries, staggered forward to the teacher's desk with a load of manuscript bearing the caption, "An Introduction to the Study of the Elephant." Long before any of these papers were turned in, however, a bustling and highly efficient American boy had confidently handed to his teacher a snappy and well organized paper on "Bigger and Better Elephants." Now doubtless the specific aspects of the elephant and his life which appealed to the several students reflect to some extent individual eccentricities. But do they not also in some measure signify characteristics that with some sharpness demarcate the cultures and interests of the national groups represented by the students? Is it not true that one who was familiar with these national cultures and with the general circumstances of the case would readily be able to specify the nationalities of the several writers upon a mere reading of the titles of the essays?

Cases are not lacking of peoples whose diverse fields of interest and activity expressed, throughout long periods of time, a single dominant set of values. Look, for example, out of a train window in India early in the morning and you will see among the natives many who are assiduously cleaning their teeth with a sharpened bit of wood; and you will note in the village pools numbers of people

engaged not merely in washing the loin cloths about their persons but more especially in purifying their bodies. Among your fellow passengers or the multitudes of people on the station platforms, as apparently everywhere throughout the country, you will find adolescent girls with babies in their arms; and, if you pursue a line of inquiry, you will be told of the early age at which girls are expected to marry, of the severe sufferings commonly attending childbirth and other experiences of married life, and of the horrors of widowhood. In your train compartment there may be a Brahmin travelling with a container of food and cooking apparatus, through whose use his private servant prepares all the cooked food that his master may eat on a journey where there is uncertainty as to whose hands might otherwise touch his food. At the railway stations you will observe separate drinking fountains and dining rooms for Mohammedans, Brahmins and Hindus of a lower caste. Now, varied as are these features of Indian life and culture, they are not radically detached from one another. They are not isolated and accidental phenomena but are alike grounded in that dharma or highly articulated and yet unified order of life called Hinduism. Beliefs, temples and their gods, social and political structure, family organization and customs, along with activities of personal life are sustained by a single root. To modify any of them is therefore not a simple matter. Any significant change would entail either a loosening from the whole or a radical transformation in the character of the dharma.

But the point thus illustrated could have been presented without going so far afield as India. Consider medieval Europe, when Christianity was thought to be a revelation of the transcendent, and its organ, the Church, was looked upon as mediating all that was of real moment to

man. Here also a central interest dominated practically all the significant phases of the life and culture alike of the individual and of society. The social and the political conscience were moulded by the Church, and the several lines of temporal pursuits, including agriculture, trade and education, were under her control. She held the rôle of arbiter not alone in conduct but also in taste and thought. The kingdoms of this world were by it assigned their respective provinces and rights, and the realm of truth was ruled by it with no less rigorous a hand. She was for a considerable period the uncontested ruler over all the domains both of idea and ideal.

Hinduism and the civilization of medieval Europe, thus, may be cited in confirmation of the thesis that the expressions "spirit of an age" or "spirit of a people" are not mere tinkling sounds. But, it may be urged, do they have meaning in reference to the civilization of modern and especially contemporary western Europe and America? Is not perhaps our present life so complex and so differentiated, and are not its several elements so thoroughly independent of one another, that one may not speak of a unifying tendency or a common goal? Or are we on the contrary justified in saying that in this case also there prevail a general standard of appraisal and a dominant set of values? In short, is there a modern spirit?

Surely this question may fittingly be pressed, and the answer is neither obvious nor demonstrable. Nevertheless, there is firm ground for the thesis that the modern world of which we ourselves are a part has exhibited, and here in America especially still exhibits, a devotion to a very widely accepted objective of action and criterion of judgment, and that this fact gives it a relatively unique character. In so far as this may be the case we may speak of "the modern spirit." If we would identify the latter may

we not find our cue in the subject which the American lad gave to his essay on the elephant? "Bigger and Better" would seem to be the watchword of modern life in western Europe and America. These terms express our aspirations in the several fields of endeavor, and furnish our standards for evaluating the various programs and projects that come into scrutiny. In so far as it is at all permissible to allege the existence of a modern spirit, this may confidently be said to center about the idea and the ideal of progress.

Confirmation hereof thrusts itself upon us no matter whither we turn. Organized religion increasingly justifies itself and its heavy drains upon the energies and resources of men, by reference to its rôle in lightening human burdens and promoting a better era of history. Theology is veering so strongly into the channels of humanism that to multitudes of deeply reverent thinkers even the theistic doctrine seems extremely anemic, if not even moribund. Educational institutions and activities are extolled for their revelation to imagination of a fairer social order, for firing the zeal and hardening the determination of individuals to achieve such an order, and, more specifically, for equipping them with a knowledge requisite for success in this enterprise. The aim even of Liberal Arts colleges and of universities, we hear it proclaimed—even when the objective for the moment is not the acquisition of endowments—is service, and service of a predominantly social sort, affecting the removal of present ills and the inauguration of a bigger and better future for mankind. Law and judicial procedure are believed healthy when they direct themselves not so much by assumedly immutable natural or spiritual laws and by considerations of inalienable nature-or God-given rights of individuals, or by so-

lidified precedent, as by conjectures respecting the probable consequences of legislation and judicial decisions. Civilizations today are rated according to the principle of progressiveness. Such of the older ideals as continue to command allegiance are those that have found new strength, to use a phrase of Bury's, "by attaching themselves to Progress."³ And thus it is, to quote further from Bury, that the "conjunctions of 'liberty and progress,' 'democracy and progress,' meet us at every turn. Socialism, at an early stage of its modern development, sought the same aid. The friends of Mars, who cannot bear the prospect of perpetual peace, maintain that war is an indispensable instrument of Progress. It is in the name of Progress that the doctrinaires who established the present reign of terror in Russia profess to act. All this shows the prevalent feeling that a social or political theory or programme is hardly tenable if it cannot claim that it harmonizes with this controlling idea."³

The idea and the ideal of progress are commonly taken so for granted by us that we fail to realize how distinctive they are, and how novel in respect to the hopes and enthusiasms which they engender, to the ideals, along with the judgments, which they control, and to the programs which they determine. It will aid our perspective if we recall that Ecclesiastes voices a widespread ancient belief in the statement: "That which hath been is that which shall be . . . ; there is no new thing under the sun." Even Marcus Aurelius wrote: "The rational soul wanders round the whole world and through the encompassing void, and gazes into infinite time, and considers the periodic destructions and rebirths of the universe, and reflects that our posterity will see nothing new, and that our ancestors saw nothing greater than we have seen. A man of forty years,

³ J. B. Bury, *The Idea of Progress*, p. viif.

possessing the most moderate intelligence, may be said to have seen all that is past and that is to come; so uniform is the world.”⁴ Common among the ancients were such beliefs as that history and the processes of nature move in cycles; or that the golden age is an epoch in the past, and that the best that may be expected by us is its recovery; or that the good, so far from being—as we now say with deep meaning—the enemy of the better, is something which, when once obtained, should by every effort be preserved.

Time, for Plato, was not an opportunity for unlimited advance toward the ideal, but, like space, was a medium which by its very nature thwarts the clear and the full manifestation of the perfect. Be it noted that the conception of progress involves that of movement as well as of time. It is therefore not without significance that even for Aristotle motion and rest were placed in opposition, and that this antithesis persisted in scientific thought until the day of Galileo, when this great precursor of the modern spirit represented motion as fundamental and rest as but the limit thereof. Now Aristotle indeed stressed the concept of development. He found throughout nature a *nisus* to the good and to participation in the divine life, and he interpreted natural existences in terms of a hierarchy in which the lower were the basis and potentiality of the higher. Nevertheless sight must not be lost of the fact that even he did not think of the different stages as successive in time. In the case of his social philosophy, to be sure, he described as later in time that which he also deemed both logically prior and superior in worth, namely, the State. Yet again he stopped short of a doctrine of progress. He never proceeded to the thesis that history represents a universal upward movement, or that advance

⁴ Quoted by Bury, *op. cit.*, p. 13.

in nature and status is possible generally as regards men and social conditions. Throughout he was haunted by the traditional ideas of cycles, and of alternations between periods of decline and of advance; and he espoused the view that the capacities of human nature as such, and likewise those of individuals, so far from reflecting cultural factors, are essentially fixed *ab initio*.

The point involved in the Semitic story of the tower begun at the place which later received the name Babel was not without its parallels. Those mortals who were of such boundless conceit that, in the words of Genesis, "nothing will be restrained from them, which they had imagined to do" and who therefore aspired to reach the very elevations of heaven, were smitten by the divine powers themselves. In the thought of the Greeks, similarly, *moira* had definitely bounded the powers of man and thus delimited him from the superhuman. In consequence, the notion of a continuous advance towards perfection either in knowledge or in happiness was deemed both untenable and irreverent, as involving an encroachment upon the ultimately controlling power of the cosmos. Dean Inge thus seems entirely secure in his generalization that the ancients generally "would have thought the modern notion of human perfectibility at once absurd and impious."⁵

To be sure we here and there find optimistic doctrines of social evolution even among the ancients. This is the case, for example, whether we look to the Epicureans or to the Stoics. The former, though generally skeptical as regards the value of civilization and aspiring primarily to rendering tolerable the lot of the individual, had their Lucretius, who used the word progress—and was apparently the very first thus to use it—in our modern sense, and who taught that, while stagnation and even retrogression

⁵ Inge, *The Idea of Progress*, p. 6.

were not completely absent, the changes within human society as a whole exhibited progress. The Stoics, like the Epicureans, were predisposed to a philosophy of resignation. Nevertheless we find among them a Seneca, who believed in the progress of knowledge. And yet, be it observed, the knowledge to which Seneca referred, while indeed capable of affording glimpses into the divine regions, was nevertheless incompetent to ameliorate otherwise the conditions of personal and social life. Hence, as Bury has pointed out, Seneca, so far from even "adumbrating a doctrine of the Progress of man" even held to the "theory of degeneration and the hopeless corruption of the race."⁶

The regime of medieval Christianity, as that of Hinduism throughout its history, we find dominated by the ideal not of change but of a fixed order. Influences emanating from theology, from Greek doctrines of a moral order, and from the Stoic conceptions of the order of nature that filtered down through Roman jurisprudence, deeply impressed themselves upon the mentality of the Middle Ages. In their science and their philosophy, too, the dominant feature was closely locked, coherent system—the temper was rationalistic. Moreover, the regard was focused upon a yonder world, and this made quite impossible the ideas and outlook that subsequently became common possessions in the notion of progress. Before the latter could arise and flourish there must come a shift of interest to the values and possibilities of the empirically experienced world of nature and of history, to the life of the here and the now; there must come also an intensified emphasis upon the fact and the significance of movement and time, as contrasted with rest and the timeless, of change as contrasted with the invariable; and furthermore, there must come striking evidences of man's power,

⁶ J. B. Bury, *op. cit.*, p. 15.

under given and attainable conditions, to effect such far-reaching changes in his world as to win emancipation from subjection to its forces, if not indeed gradually to gain an effective mastery over them. The story of these changes would involve chapters on the recovery of ancient civilization, with its striking demonstration of a rich cultural life outside the pale of the Church, and of intellectual wealth amassed through the activities of human reason and imagination when pursuing their own laws. It would include accounts of the discoveries of new worlds, with their stimulus to imagination and curiosity, no less than their promise of limitless wealth. It would describe political struggles, and the aroused ambitions for lives of power and for free expression of personality. It would take cognizance of rising towns which vied in industry and technical skill and zealously sought new artifices, machines and implements of war to promote their economic and military ends. It would tell of the inventions that conquered distance and thus facilitated travel and the exchange of both goods and ideas. It would stress the successes of those thinkers who sought to master the principles of such changes and of inventions, to develop their logic, to construe in their light the meaning and the ideals of human life—yea, by their aid even to interpret the cosmos.

In saying this, and in underscoring the novelties in the modern spirit, we would not deny those large continuities that make of history a story. In some sense the developed religious consciousness is optimistic and regards with confidence the world as ruled by its God; and thus, in so far as considerations of the future are involved, it has faith in the triumph of the good, even when it advances no theory as to the manner thereof, and does not think of the advance as steady and unbroken. Like certain types of

philosophy, it inclines to envisage a cosmos which securely harbors ultimate values. When, then, reality is or comes to be viewed as qualified by time, the doctrine of an inevitable increase in values, under the operation of metaphysical principles or of the divine agency, speedily makes its appearance. Similarly, the cosmology of the Greeks was at least in large part dramatic. As Whitehead has pointed out, it "conceived nature as articulated in the way of a work of dramatic art, for the exemplification of general ideas converging to an end. Nature was differentiated so as to provide its proper end for each thing . . . Nature was a drama in which each thing played its part."⁷ Moreover, in some degree all voluntary action, particularly when battling with stubborn obstacles, presupposes some dedication to a better future and some belief in the possibility of achievement. Thusfar such action, especially where it involves the participation of co-operating individuals, presupposes the idea and the possibility of progress. The latter, therefore, may in some sense and measure be credited to all men; and the religious consciousness of medievalism was further convinced of the over-ruling power for good in the cosmos at large. What was needed, however, to give to such ideas the quality of the modern spirit were a number of unshakeable convictions—convictions of the ultimacy of time and change, with their bearing upon human hopes and possibilities; of the continuity of the future with the conditions of the past; of the capacity of man, under the guidance of thought, to transform the circumstances of life, both individual and corporate, and even to add a cubit to his stature; of an ethical responsibility to discern ills that require remedy, and to devise means at once curative and preventive. Joy in

⁷ A. N. Whitehead, *Science and the Modern World*, p. 11.

life and faith in nature, coupled with a sense of human power and human responsibility, came to be forces that fortified the conception of man's unlimited perfectibility.

But what is Bacon's relation to this ideal of progress that did so much to shape modern culture as its indwelling and informing spirit? First of all this: Bacon was himself thoroughly imbued with the progressist soul. Now, "the kind of philosophy one chooses depends upon the kind of person one is. For philosophy is not like a piece of furniture which may be selected and discarded at will." This remark of Fichte's is apt indeed in the case of Bacon. And in understanding the man who generates a corresponding type of philosophy, it is noteworthy that precisely in so far as he possesses penetration and sensitiveness will he be alive to the deeper currents of his age. Now, Bacon's was a day in which printing, gunpowder and the magnet had made their appearance and these, in Bacon's words, "changed the whole face and state of things throughout the world; the first in literature, the second in warfare, the third in navigation; whence have followed innumerable changes; insomuch that no empire, no sect, no star seems to have exerted greater power and influence in human affairs than these mechanical discoveries."⁸ Far-reaching social and political changes were giving promise of an enrichment and intensification of human possibilities and enjoyments. Bacon's age, furthermore, had witnessed the rise of new lines of investigation and of novel scientific methods, and these, in the persons of Leonardo da Vinci, Kepler, and Galileo—not to speak of their precursors and of Bacon's own contemporary countryman William Gilbert—had done much to dispel the mysteries of nature. To all these various influences Bacon was respon-

⁸ *Novum Organum*, I, Aph. 129.

sive to a high degree. Temperamentally he was averse to the life of a cloistered scholar, and according to his reading of history it was through withdrawal from practical affairs that the ancients were led into barren speculations. Hence he was disposed both by inclination and by theoretical convictions to participate in the life of his day. Knowledge he would vitalize through connection with work-a-day experiences, through intimate relations to practice and empirical observation, through direction to humanly significant ends.

Giving full weight to all that may be claimed respecting Bacon's political and worldly ambitions, we are nevertheless warranted, upon a consideration of his life as a whole, in accepting his own profession that the progress of science was his deepest passion, and this because of the promise of science for human wellbeing.⁹ Furthermore, he was convinced that truth is rightly "called the daughter of time, not of authority" and that our high regard for antiquity is misplaced for "the old age of the world is to be accounted the true antiquity; and this is the attribute of our own times."¹⁰ Still again, the good life, for Bacon, consists in the pursuit of happiness for mankind as a whole in this our terrestrial habitation—that is, as he phrases it, "of power and dominion of the human race itself over the universe."¹¹ This pursuit, Bacon never doubted, could be crowned with success through the use of proper and discoverable methods and the willing co-operation of men. Here, then, we find elements involved in every significant ideal of progress. Because they found in

⁹ Cf. the first chapter in Kuno Fischer's *Francis Bacon of Verulam*, translated by John Oxenford; also James Spedding's *The Letters and the Life of Francis Bacon*, vol. I, p. 4.

¹⁰ *Novum Organum*, I, Aph. 84.

¹¹ *Ibid.*, I, Aph. 129.

Bacon an early representative, if not their first clear and vigorous spokesman, it is not strange that Bury begins with him, along with Bodin and Le Roy, his illuminating account of the origins of the idea of progress. To be sure, Bacon is represented by Bury as among the great precursors of the new era and not as one who really enunciated a theory of progress: Bacon's "conception of his own time as the old age of humanity," we are told, "excludes the conception of an indefinite advance in the future, which is essential if the theory is to have significance and value." To rest one's judgment at this point, however, would seem unjust. Bacon did indeed contend that he had discovered the key to the secrets of nature and that the future was in so far already captured. On the other hand, he repeatedly stressed the need for continuous research through systematic, co-operative effort carried on throughout the ages, and he held that thereby, though only thereby, there would come a steady improvement in the lot of man.

Bacon's progressist soul reacted with violence against the existing state of philosophy, as indeed against the doctrines of most of the earlier philosophers. In the case of his younger contemporary Descartes, it was primarily the confusions and the divergent teachings of the several philosophers that brought doubt and rejection. In the case of Bacon, however, the dissatisfaction was due partly, indeed, to the fact that the traditional philosophies were apparently unable to settle one question at a time so as to pass on to others and thus to build up a temple of truth, but partly—and primarily—to the fact that they were essentially barren. Their methods, their teleological preoccupations, and their conclusions were all such as to prevent them from playing an effective part in life and thus

of possessing practical value. Bacon therefore invites to his company all such as aspire "to overcome, not an adversary in argument, but nature in action; to seek, not pretty and probable conjectures, but certain and demonstrable knowledge."¹² He goes so far even as to insist that: "The logic now in use serves rather to fix and give stability to the errors which have their foundation in commonly received notions than to help the search after truth. So it does more harm than good."¹³ Bacon, to be sure, did not entirely scorn inquiries into final causes. The difficulty, he avers, is that these have been misplaced; they have been assigned, as he puts it, to "the substance of sciences," and this "hath caused a deficiency, or at least a great improficiency, in the sciences themselves."¹⁴ What the teleology of nature gives us, he holds, is a "confutation of atheism"; it enables us to conclude to the existence and to some of the attributes of God. Yet even here it must not be overlooked that Bacon thinks that even for the purposes of religion this knowledge is inadequate and must be supplemented by revelation. The main burden of his emphasis, however, is upon the fact that there can be no applied teleology; "the research into Final Causes," he writes, "like a virgin dedicated to God, is barren and produces nothing."¹⁵

The significant problems of theory, for Bacon, relate not to *why* things happen but to *how* they happen, not to final but to efficient causes. Inquiry into the latter affords results that divulge real connections in nature and therefore yield knowledge. Moreover, this knowledge is at the same time such as facilitates more satisfactory ad-

¹² *Ibid.*, Preface.

¹³ *Ibid.*, I, Aph. 12.

¹⁴ Quoted from Kuno Fischer, *op. cit.*, p. 93.

¹⁵ Quoted from C. D. Broad, *The Philosophy of Francis Bacon*, p. 14.

justments to the environment and more perfect control of its forces. Thus it contributes to the ethical goal dictated by the soul of Bacon and advanced in his ethical theory—namely, to “lay more firmly the foundations, and extend more widely the limits; of the power and greatness of man.” Man’s real power springs from knowledge. Moreover practical results are the solid justification of scientific research, indeed are the most reliable test of scientific truth.

Bacon’s dictum, in his well-known aphorism, that “human knowledge and human power meet in one”¹⁶ symbolizes the extent of his break with the past and concentrates the principle that flowered in the modern spirit. “Knowledge is power,” said Bacon. And Bertrand Russell, like many another who has analyzed the structure of post-Baconian knowledge and the logic of modern science, has of late stressed the extent to which we may affirm that to know something is to be able to change it as we wish. Dewey, likewise, when concerned to interpret the procedure and the inmost meaning of those bodies of knowledge that today commend themselves to enlightened minds, affirms that knowing is a mode of experience which furnishes the “possibility of intelligent administration of the elements of doing and suffering.” And so, he teaches, physical science must not set itself the aim, nor must it be thought of as serving the purpose, of disclosing the ultimate essence of things. What it does is to divulge those properties, that is those events, by virtue of which things become means to ends. This emphasis upon utility in discussions both of logic and of scientific methodology must not, however, in the case of Bacon any more than of Dewey, be construed as pragmatic in the very narrow

¹⁶ *Novum Organum*, I, Aph. 3.

sense of this oft misunderstood term. In reference to a short-sighted pragmatic doctrine Bacon entered a vigorous protest. Writes he: "That unseasonable and puerile hurry to snatch by way of earnest at the first works which come within reach, I utterly condemn and reject, as an Atalanta's apple that hinders the race"¹⁷ "Though it be true that I am principally in pursuit of works and the active department of the sciences, yet I wait for harvest-time, and do not attempt to mow the moss or to reap the green corn."¹⁷ Be it noted, however, on the other hand, that Bacon sharply differed also from those who concern themselves with "the first principles of things and the highest generalities of nature," who "cease not from abstracting nature till they come to potential and uninformed matter, nor on the other hand from dissecting nature till they reach the atom." For these are "things which, even if true, can do but little for the welfare of mankind." "Utility and the means of working result entirely from things intermediate."¹⁸

Progress was for Bacon the ultimate objective. But progress, he insisted, comes "not from soil, not from climate, not from race, but from the arts"; "man is a god to man."¹⁹ More especially is it invention that offers the one speedy and secure method to the attainment of progress. But invention must no longer be left to mere chance and the accumulations of lucky discoveries. Instead of the latter we must look to knowledge. But the knowledge which is capable of yielding inventions cannot be spun by reason from out its own innermost recesses, as is the wonderful but flimsy web from the spider. Fruitful knowl-

¹⁷ *The Great Instauration*, Modern Student's Library volume on Bacon, p. 27.

¹⁸ *Novum Organum*, I, Aph. 66, is the source of the quotations in the three immediately preceding sentences.

¹⁹ *Ibid*, I, Aph. 129.

edge must have its footing in the facts to be understood and controlled. It must face existent realities free from all the veils that obscure them from our vision. We may master nature in practice only as we render her implicit obedience in the knowledge process. We need, therefore, rid ourselves of those predispositions and predilections, those idols, which distort our view. We must refrain from reading into nature our own desires and the pursuit of ends; we must be on our guard against any deflections arising from those experiences which are peculiar to ourselves as individuals; we must avoid the temptation of confusing words with things and the guiles of misleading theories and philosophical systems. In sum, the knowledge which Bacon desiderated reflects what Whitehead has called "a new mentality" such as William James characterized when, while finishing his *Principles of Psychology*, he wrote to his brother Henry James, "I have to forge every sentence in the teeth of irreducible and stubborn facts."²⁰ Partly because of his fear of the dangers that lurk in reason's proclivity to sheer speculation and to the deductive unreeling of conceptions, and partly because he lacked gifts in mathematics, Bacon was peculiarly blind to some of the essential features of the great scientific work that immediately antedated him. He failed adequately to realize the dependence of scientific method and of scientific conclusions upon mathematics. Hence he was prevented from either stating or working out "far-reaching physical theories himself."²¹ Fearful that nature would not be permitted herself to dictate the connections of our ideas, he was suspicious of all tendencies of the mind to anticipate nature. Such anticipations, he believed, tended to lead to the selection of those facts alone which are con-

²⁰ Cf. A. N. Whitehead, *op. cit.*, p. 3.

²¹ C. D. Broad, *op. cit.*, p. 62.

firmatory; indeed, they might even result in the strait-jacketing of facts. In such moods and contexts, Bacon at times held that genuine knowledge comes primarily through an accumulation and analysis of facts. He then insisted that the understanding must not "be allowed to jump and fly from particulars to remote axioms"; it must not "be supplied with wings, but rather hung with weights, to keep it from leaping and flying."²² This apparently overlooks the plain but important point that facts must function as stimuli to rationally developed hypotheses, through whose use alone observation may be significantly guided in such wise that principles acquire confirmation and that facts acquire the universal significance essential to every candidate for a knowledge that aspires to power.

In this matter, however, Bacon does not speak with a single voice. When not intimidated by the dangers of a barren or obfuscating rationalism and the temptations of thought to run amuck in the terrain of fact, he himself expressly recognized the indispensability of thought, as well as of empirical observation, in the acquisition of knowledge. Science may not emulate spiders, as we have already noticed; nor yet, as he teaches, may it like ants simply gather materials without selection and store them without modification. Rather must it bring rationalistic and empiristic procedure into fruitful union.²³ Like the bee, it must gather materials from nature, but then work them, through its own activities, into honey. Indeed, if order is to be introduced into the welter and confusion of fact, reason must, with proper precautions, proceed to or-

²² *Novum Organum*, I, Aph. 104.

²³ "I suppose," writes Bacon, "that I have established forever a true and lawful marriage between the empirical and the rational faculty, the unkind and ill-starred divorce and separation of which has thrown into confusion all the affairs of the human family." *The Great Instauration*, Modern Student's Library, volume on Bacon, p. 15.

ganize its materials by reference to hypotheses: truth, said Bacon, "will sooner come out from error than from confusion."²⁴ "The true method of experience," he also wrote, "first lights the candle, and then by means of the candle shows the way; commencing as it does with experience duly ordered and digested, not bungling or erratic, and from it educing axioms, and from established axioms again new experiments."²⁵ Bacon declared that "a greater abundance of experiments" must be "sought for and procured, and that too of a different kind from those hitherto tried."²⁶ Furthermore, he recognized that the process of getting materials itself involves criticism and the use of instruments. The thermometer, for example, affords the corrective of thermal sensations, and the telescope and microscope are needed extensions of the range of unaided vision. Therefore he writes: "Neither the naked hand nor the understanding left to itself can effect much. It is by instruments and helps that the work is done, which are as much wanted for the understanding as for the hand. And as the instruments of the hand either give motion or guide it, so the instruments of the mind supply either suggestions for the understanding or cautions."²⁷

Bacon was not himself a discoverer of new facts nor a frequent or competent experimenter. Fitting, however, it is to recall that it was in consequence of an experiment that he met his death.²⁸

²⁴ *Novum Organum*, II, Aph. 20.

²⁵ *Ibid.*, I, Aph. 82. Cf. *The Great Instauration*, Modern Student's Library volume on Bacon, p. 15. "No excellence of wit, no repetition of chance experiments, can overcome such difficulties as these. Our steps must be guided by a clue, and the whole way from the very first perception of the senses must be laid out upon a sure plan."

²⁶ *Ibid.*, I, Aph. 100.

²⁷ *Ibid.*, I, Aph. 2.

²⁸ To test the hypothesis that flesh might be preserved in snow, he alighted from the coach in which he was riding, bought a hen from a peasant, and proceeded to make the experiment. He suffered a severe chill and this resulted in his death.

Quite apart, then, from the fact that Bacon set forth in detail necessary precautions in the use of the inductive method, and quite apart from his insistence that induction by simple enumeration must yield to the use of negative and prerogative instances²⁹—so that Bacon anticipated Mill's joint method of agreement and difference, supplemented by his method of concomitant variations—Bacon must be credited with a doctrine of fruitful scientific procedure which is not wholly oblivious to the value of hypothesis and experimentation and thus also to the rôle of deduction.

To Bacon a correct logic and a proper scientific technique seemed of such paramount importance that he sometimes ventured to affirm that industry alone would be required to secure by their use an advancement in knowledge. Thus again, from this angle also, he must be accused of an inadequate estimate of the indispensable function of the creative understanding and the imagination in the promotion of science. His doctrine affords yet another evidence of his violent reaction against speculative constructions; it is testimony of his insistence that nature must scrupulously be followed as she tells her own story if we are to win that familiarity with her which will put us in possession of controlling leverages. It likewise, however, bears witness to Bacon's buoyant hope and firm confidence that progress is secure. Bacon was an unwavering optimist. His justification for this outlook, however, was not that of those of his predecessors who referred to guiding or indwelling divine or metaphysical powers. Bacon relied upon the fact that once and for all

²⁹ "For the induction . . . which proceeds by simple enumeration is a puerile thing; concludes at hazard; is always liable to be upset by contradictory instance; takes into account only what is known and ordinary; and leads to no result." *The Great Instauration*, Modern Student's Library volume on Bacon, p. 22.

there had eventually been gained the method of extracting from nature the secrets of her operations. This was for him also an achievement of great psychological import. For man must needs undertake new tasks; he must strive for progress through invention, and for invention through the advancement of science. But, believed Bacon, by far the greatest obstacle to such effort is the fact "that men despair and think things impossible."

As has variously been intimated, Bacon's success fell considerably short of his estimates thereof, and in some respects his doctrines failed even to express the best scientific procedure of his own day. Nevertheless, for heralding as he did the ideal and the possibilities of progress, and for giving logical expression to methods fitted to extend the frontiers of solid knowledge and to improve the lot of mankind, Bacon deserves the high place accorded to him in the history of man's struggles for the bigger and the better.

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PSYCHOLOGY AND PSYCHICAL RESEARCH

ONE of the first and most valuable of the lessons which Science has had to teach mankind has been *distrust* in the senses which so obviously appear to the ordinary man to be his only avenue to reality. To disillusion him on this point the sciences have laboured long and earnestly, and two stages have been required to effect it. At first, in antiquity, it had to be shown that the senses were deceptive and full of traps for the unwary. At this stage the ordinary man might be forgiven for thinking, as some philosophers still think, that scientific criticism of the deliverances of the senses was merely *sceptical*: but the subsequent history of the sciences has shown that it was merely *prudent*. For in modern times Science has gone on to show man that true knowledge is at bottom *power*; it now *protects* him against the defects of his senses, and equips him with a huge number and variety of instruments which enormously extend the scope, and increase the value, of the senses as means of knowing the real. Hence no one in his senses now thinks that the scientific criticism of sense-perception is sceptical in intention or effect.

But the work of science remains incomplete so long as we have not learned to test and scrutinize also the rest of our cognitive outfit, namely our desires, our emotions, and especially our so-called 'reason'. Now of these the two former are commonly recognized as dangerous and de-

ceptive, but in the third our intellectuals have put far greater trust than either its achievements or its defects could warrant. Yet the whole history of philosophy may be read as an illustration of the deceptiveness of 'reason.'

Now the science to which the duty of teaching us properly to distrust our reason would naturally fall is Psychology: but Psychology, in spite of its importance and antiquity, is still in a very backward state. It has never been able either to discover a method of its own or to borrow an analogy from elsewhere that would really work and give it any effective *control* over the phenomena it studies. The result is that we have many psychologies—about a dozen at the moment—all different and all eager to offer (divergent) descriptions of mental life in technical and often highly ingenious terms, but no really *effective* Psychology that would enable us to control the mind and to remould it nearer to the heart's desire. Psychology as a whole therefore cannot yet be said to stand the pragmatic test, or to be a science in the fullest sense. It is still in the incipient stage of experimenting with assumptions which it may hope to turn into the principles on which a progressive science may be built. It is still engaged in selecting the 'facts' it is resolved to notice: it is still, in short, in that preliminary, but logically most interesting and instructive, phase of scientific development, in which everything as yet is plastic, with 'facts' still in dispute, 'principles' not yet settled, and with an abundance of alternative 'explanations.'

I

Now one of the methods of experimenting psychologically which we may adopt to explore this difficult but fascinating subject of Psychology is that known as Psychological Research. It differs from the ordinary psychologies

in its choice of the analogy which it adopts as its clue to the labyrinth of psychical facts. It has remained faithful to the original meaning of psychology as the science of the 'soul' whereas the academic psychologies have nearly all departed from it and become paradoxical 'psychologies without a soul.' They have allowed themselves to be fascinated either by the *prestige* of philosophy or by the success of the physical sciences. So they assumed that the nature of mind would be revealed either by philosophic argument or by faithful (not to say servile) imitation of the methods which had proved so effective in the physical sciences.

But both these anticipations have been falsified. Despite the obvious and undeniable connexion of the psychical with the physical, the analogy with the physical has proved sterile. The mind-body problem still defies solution—for it is no solution to abolish mind, on paper, to preserve a prejudice—and the transfer of 'exact' experimental methods from physics to psychology steadily refuses to yield results commensurate with the labour and ingenuity devoted to them. Now that physicists have realized that their 'laws' are only statistical averages, and are beginning to suspect that something remarkably like a psychological factor enters into the behaviour of their ultimate reals, it seems likely that enthusiasm for the physical as the master-key to everything psychical will be considerably abated.

The bankruptcy of philosophic psychology had been declared long before. Mental life therefore is still beyond control so far as academic psychology is concerned.

The clinical analogies and methods of the psychoanalysts, and psycho-theraputists generally, for a while seemed more promising; but it is gradually growing clear that they too have found no Open Sesame. The success of their practice is insufficient to make up for the defects of their theories, which seem obscure, arbitrary, incoherent

and even absurd; and, even clinically, their methods are chancy and of doubtful efficacy.

II

The coast therefore seems to be clear for Psychical Research. Psychical researchers may rightly plead that their method is worth trying; and, if they ask to be taken up humbly, pertinaciously and prettily enough, they may now find the scientific world more open-minded than formerly and readier to explore what may prove to be as extensive a field of research as the physical. But they should make a clean breast of it.

They should admit at the outset that they are harking back to a very ancient stratum of beliefs, to a conception of 'soul' and its priority and power over the physical which underlies primitive 'animism' but has never been considered amenable to scientific method. Still it is worth remembering that the assumptions of commonsense realism are even more ancient than the notion of 'soul'; and admittedly neither science nor philosophy can dispense with them in practice.

Moreover these authorities have not been happy in their dealings with this very primitive notion of 'soul'. They have succeeded neither in explaining it nor in explaining it away. Neither as a 'substance', nor as a series of 'impressions and ideas', nor as a principle of 'synthetic apperception' have philosophers been able to account even for the *undisputed* functions of the 'soul'. The perversion of scientific method which leads to materialism or 'behaviorism' has no less conspicuously failed to *explain away* the soul: the pretence of its unreality is simply nonsense, and makes nonsense of all science. For what is science ultimately but an attempt to gratify our *desire* to know?

III

Psychical Research therefore is really more rational than philosophy and more scientific than science, in not pretending to know in advance of inquiry what 'soul', *alias* 'spirit', *alias* 'consciousness', *alias* 'self', is or can do. It is both scientific and practical in setting itself to find out *empirically*, by investigating the alleged evidence as to its doings.

This however is easier said than done. The difficulties in the way of effective Psychical Research are stupendous, and they will be overcome in the end only if they are recognized at the outset. The ordinary difficulties of inquiry which are common to the initial stages of a science are here enormously augmented. The scientific inquirer should everywhere start with a mind full of doubts and critical reserves about the adequacy and value of the hypotheses he uses as 'principles', for lack of any better. He should be prepared to encounter 'facts' which are no facts, or, even worse, are so infected with error and misapprehension as to be more misleading than pure illusions. He should expect also to find it difficult to experiment with any precision, nay even to experiment at all or to know what to observe. For he does not yet know whether his initial analysis of his subject is sufficiently relevant to start him on his way to truth, and cannot estimate on what conditions success and failure will depend. Nor has he sufficient *power* over the conditions to vary them at will and to select intelligently the important points he needs to inquire into further. Such power over his phenomena is the fruit only of a knowledge which *ex hypothesi* he has not yet acquired.

But these are the ordinary obstacles to the making of *any* science, and there is no reason to assume that intel-

ligent endeavour will not overcome them in Psychical Research as it has done elsewhere. What complicates the situation here is the number, complexity and intensity of *peculiar* sources of error which are largely of a psychological nature, and do not beset inquiry into matters that do not touch us so intimately. When a mathematician sets himself to work out the implications of a new conception, which is pretty sure to be an extension by analogy of an old one, he may be mildly (or even keenly) interested in the consequences; but he does not feel that his whole being is at stake and that his whole future depends on the success or failure of his hypothesis. But in Psychical Research the hypotheses in question are such that they can hardly fail to stir the most impassive soul, and to arouse intense emotional reactions. How can anyone be indifferent to the question whether the 'soul' is immortal, and whether he may look forward, or is doomed, to a life after death? This possibility must, it seems, produce an emotional bias, and render it desperately hard to conduct the inquiry *fairly*, and without vitiation by prejudice.

It would however be a mistake to assume that there was only *one* prejudice to guard against. Men *differ* in their reaction to this prospect. It is certainly not true that *all* desire a future life. A large number do *not* desire it, for various good and sufficient, but largely personal, reasons; and they are often influential persons. But they hardly ever *avow* their reasons, which therefore escape examination and criticism. This *hostile* bias is all the more insidious and dangerous because it works beneath the surface and in the dark—like moles and 'mediums'.

It may be true, no doubt, that the majority of men are desirous of believing in a future life and some kind of immortality for their 'soul'. The majority may even be a large one, *in a sense*. If, that is, all are counted into it

who *at any time* have felt the theory of immortality to be of spiritual importance to themselves. For this is an emotional condition which commonly attends the bereavements that afflict our mortal life.

But it does not follow that, at any given time, the majority share in, or approve of, this sentiment. On the contrary, in normal times the great majority are *strongly opposed* to any such 'unhealthy' interest in the future life, and there is severe social repression of those who proclaim its transcendent importance. Probably, in ultimate analysis, this opposition rests on nothing more respectable than the shrinking from the thought of *death*, which is implicit in any thought about immortality; but its strength is well brought out by the singular perversion which has overtaken the religious doctrines on this subject. In theory, the great religions are all ardent advocates of heavens or hells; but in fact they have all been watered down into a vague 'hope of immortality' which shrinks from testing, is quite ineffective, and can detract from no one's attention to business. The correctness of this estimate was curiously attested during the war, when the terrible prevalence of personal tragedies made the bereavement sentiment dominant for the time. The normal opposition to its manifestations was patriotically silenced, and there seemed to be a great wave of spiritualism threatening to deluge the high places even of the driest intellectualism. But a year or two later the social taboo was reimposed; I happened to be present when a representative of a great London daily called on the Secretary of the Society for Psychical Research to inquire whether the time had not come to do so, and was disappointed when no 'interview' was granted him.

The truth is, then, that the craving for immortality is highly seasonal, and that the 'belief' in immortality waxes and wanes with it. On the whole, taking mankind at large

and through the ages, it is a typical '*half-belief*', for the analysis of which I may refer to my *Problems of Belief*, ch.V. But this does not make it *easier* to allow for, but harder, and complicates the problems of psychical investigation, because the scientific inquirer has to detect and discount so many sorts and shades of personal bias in every case he pries into.

As a consequence of this prevalence of bias, for and against, we may lay it down as an indispensable rule of investigation in Psychical Research that no statement on *either side* should be accepted on authority without stringent investigation; for such investigation will not infrequently show that perfectly respectable and otherwise credible witnesses have in this instance cheated and given false evidence—of course all from the highest motives!

VI

Next in importance to the perturbations due to bias come the obstacles in the way of research caused by deceptions, whether conscious fraud at the hands of others, or unconscious self-deception. The latter is so potent a factor that descriptions by a believer in psychical phenomena and by an unbeliever of the same events are often hardly identifiable as referring to the same affair. Both the frauds and the self-deceptions however are largely psychological, and they pass into each other, and play into each other's hands, in the most curious fashion. It is not too much to say that, of those who are deceived by trickery, three quarters are taken more than half the way by self-deception. Also what trickery there is would seem to depend more on exploitation of expectancy and lapses of attention than upon actual prestidigitation and the use of machinery, like ordinary conjuring.

It is this subtle co-operation of fraud and self-decep-

tion, rather than the mere prevalence of trickery, that creates the difficulties for psychical research in the *séance* room. For mere fraud is not impenetrable; it can be dealt with by the methods of the lawyer in handling a lying witness. But to cope with a witness who has had a genuine experience which he cannot understand, and then deceives himself in the interpretation and is ready to eke out his achievement fraudulently, needs psychological insight as well as legal acumen.

It would appear, however, to be an exaggeration to contend that no adequate safeguards against fraud can ever be devised. It is true no doubt that the absence of light in dark *séances* is *prima facie* a cloak for fraud and a very serious impediment to observation. It precludes ocular demonstrations, but after all other precautions may be taken, and progressively increased in stringency, until all conceivable possibilities of fraud are barred. Even now, in the more sensational exploits of the 'mediums' it is not so much the laxity of the conditions as the credibility and good faith of the witnesses that is impugned. Moreover the lack of control by the eye may be made good by a more extensive use of apparatus. It should not be difficult to set up machinery enough to obtain an automatic record of all that passes, physically, in the *séance* room, and even secretly to photograph all that happens, by invisible light. This would be simply a question of raising the money to build an adequately equipped psychical laboratory. Lastly it is not inconceivable that results may be attained which on the face of them proclaim their supernatural character, and could not have been achieved by normal means. The paraffin moulds of clenched hands obtained by several mediums, the pictures that formed themselves on the 'ectoplasm' exuding from 'Eva C', and now the fingerprints on dental wax produced by 'Walter'

in the sittings of 'Margery' Crandon, would seem to be 'physical phenomena' which approximate *prima facie* to a fulfilment of this requirement. That few or none of the cases of 'subjective' phenomena seem to approach this standard seems to be mainly due to the difficulty of proving that a given bit of knowledge is truly supernormal and could not have entered a mind in a normal but forgotten manner. No doubt in a number of cases which at first were thought to satisfy this requirement, possibilities of trickery will subsequently be discovered; but this would only show that it is no more possible to exhaust the possibilities of fraudulent than of genuine knowledge, *a priori*, and that science can learn also from its failures. Decidedly, then, scientific research is well able to protect itself against fraud if it chooses, and if social approval provides the means for an investigation which may well be both prolonged and costly.

V

We may disallow also the somewhat dialectical objection, on which the editorial columns of *Nature* now seem to rely, that scientific investigation is impossible where, not the investigator, but the medium or the medium's control determines the conditions of experiment. For though this may be a suspicious circumstance justifying special caution, the value of an experiment does not in the end depend on who (or what) suggested it, but on its own character. Otherwise the theory of gravitation would have been discredited by the trivial accident of Newton's apple. If therefore an experiment was a good test and worked out well, the scientist should not allow his personal pique at not having been the first to devise it to vitiate his judgment.

On the other hand there are two formidable obstacles in the path of Psychical Research which have not yet been mentioned. The first is wholly practical and may be called the *lack of experimental control* over the phenomena inquired into. The second is theoretical and is composed of the philosophic difficulties of thinking out a world-order in which 'souls' and 'spirits' are effective entities that must be reckoned with. Certain considerations may however be adduced for holding that neither of the obstacles should prove insuperable.

Of course the psychical researcher's present lack of experimental control over his subject is an enormous practical drawback. It means not only that he cannot devise any decisive experiment but that he cannot summon up, multiply, and test the evidence at will, and according to requirements. He is reduced to the position of a dependent observer of whatever phenomena may chance to swim into his ken. He cannot try the sort of tests he requires nor direct his inquiry upon the doubtful and vital points. So he can do nothing to *ensure* the progress of his subject.

It follows that at present the logical status of Psychical Research is a weak one. It cannot stand the pragmatic test, on which in the end science always relies to overpower opposition. Even its best attested 'truths' remain probable and disputable, and it is a matter of taste and idiosyncrasy whether one believes them or not. This renders truth highly precarious in a subject where, as we have seen, many are tempted to disbelieve for reasons of their own.

But there is nothing in this situation as such which is *peculiar* to Psychical Research. All these difficulties beset any subject in which no experimental control has been attained. What renders the situation dangerous is the strength of the party hostile to the subject, and the fact that until experimental control is achieved the evidence in its

favour must remain *historical*. This again is not in itself a peculiarity, for there is a historical side to *all* scientific truth. Every such truth has been discovered and verified by a definite number of experiments or observations made by certain investigators at certain times. But where there is experimental control this body of evidence can be augmented at any time to any desired extent. Consequently the scientific truth becomes in a sense independent of the actual experiments which established it. Nor do the historical records which attest it lose credence with the lapse of time, because they can always be renewed by fresh experiments, even though these are not performed.

But in Psychical Research the evidence is continually being sapped and undermined by what seems the mere lapse of time. Evidence which was adequate at the time, and satisfactory and cogent to contemporaries, becomes vague, legendary, and incredible for later generations, which no longer know the witnesses and their character. Here the lapse of time, by turning first-hand attestation into documentary, is really nourishing a persistent doubt which has never been eradicated. For a really tenacious doubt can only be set at rest by a constant stream of corroborative evidence. Or, better still, by the pragmatic working of a truth in everyday life. It then soon ceases to be worth the sceptic's while to doubt the truths he sees in operation all around him.

At present, however, one must admit that Psychical Research has not yet overcome the weakness due to lack of experimental control, and must add that there does not seem to be any immediate likelihood that it will do so. Still one never knows.

VI

The second weakness of Psychical Research refers us back to the beginning of this article, in which it was pointed out that the belief in 'souls' was directly descended from primitive animism. It must now be emphasized that for primitive thought the notion of soul was by no means otiose and merely decorative. Souls were conceived, not as idly 'contemplating' the happenings in their bodies, but as highly *efficacious* agencies that inspired the course of nature. Modern science, however, appears to have wholly lost this conception of soul, and it may be suggested that it is precisely because it has done so that it has come to doubt the soul's real existence.

Yet this loss may have been a real loss to science. It has rendered incredible, not only the alleged impacts of the world of 'spirits' on our own and the bulk of the evidence for Psychical Research, but also a number of very attractive interpretations of the physical world, and particularly of the physiological processes of living organisms. For if we consent to entertain the thought that the soul may be an efficacious principle, it may be conceived as really animating and *moulding its body*, and we may proceed also to ascribe a psychic side to all material beings. That might render it more intelligible how even the electrons seem to *know* exactly where they are going, as they jump about from orbit to orbit within the 'atom'. And if we are willing to try the hypothesis that the soul may mould its body, we may cherish hopes of finding means of persuading it to *re-mould* us into something better. We have good reasons, then, for reconsidering the assumption that 'soul' must be an inefficacious, impotent 'epiphenomenon' that has no power over 'body'.

How did this dreary dogma ever come to prevail? The decisive reason seems to go back to Platonic metaphysics.

Plato was the inventor and champion of 'pure' spirit, and thought it necessary to protect its purity from all contact and contamination with the material. So he made the spiritual or 'Ideal' world constitutionally incapable of change or process, and degraded the physical, sensible world to 'mere appearance'. But science could make nothing of Plato's immutable patterns, and devoted itself to the study of the physical phenomena that 'pure spirit' did not deign to deal with. Naturally, however, as scientific methods prospered, what had begun as a modest disclaimer of topics too high for scientific treatment turned into an arrogant denial of the spiritual realities which claimed to transcend scientific treatment. So 'pure spirit' was taken at its word, and brutally told that if it would not *work*, neither should it be allowed the fun of 'contemplation', nor be supported at the expense of science. Since this support was withdrawn it has eked out a miserable existence and fed upon the thin abstractions of philosophy, till even its staunchest admirers may now be prepared to question the wisdom of separating it so utterly from the world of sensible reality.

If they show willingness to put their notions to the test of scientific working, shall Science reject their overtures? Assuredly it should *not*, and the marvellous alacrity with which scientists of late have been willing to scrap and remodel their most fundamental principles, from the conservation of energy down, augurs a favourable answer to a summons to enter upon the tantalizing field of exploration called Psychological Research.

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LOGIC AND LANGUAGE

ALTHOUGH Aristotle was not a pure formalist, he is rightly considered the father of the traditional logic. Many of the tendencies still found in logical analysis may be traced to his writings. It is interesting to note that his analysis of the proposition is linguistic. We only have to read his *De Interpretatione* to realize how strong the hold of linguistic analysis was upon him. For example, he defines the substantive in terms of the timeless,¹ because he finds no time indications in the Greek noun. Of course the Greek language has the word "widow," but apparently he never gave that term consideration. The word "widow" carries a time reference, since it indicates a woman who has had a husband but does not have one now. But Aristotle thought that all nouns were timeless and probably that accounts for his whole theory of timeless essences.

The traditional logician thought that the typical form of logical expression is to be found in the predicative sentence. This linguistic form is our clue to logic. The logician attempted to reduce all forms of expression to the predicative proposition. By the predicative proposition I mean a sentence in which the assertion is made by means of the verb "to be" used predicatively. Now it is interesting to note that the logicians gave this verb a timeless meaning, such a meaning as we have in the expression of

¹ *De Interpretatione*, 16^a 19.

mathematical truths. The propositional form was always assumed to take a meaning analogous to that found in the formula, "The triangle is a three-sided figure." Here the verb "to be" means "was, and is, and ever shall be, world without end, Amen." The formal logician thought that the predicative sentence was logic applied, yet he turns about and denies his theory by giving the predicative sentence a meaning in every case that is only applicable to a limited number of cases, for most of the predicative sentences have a definite time reference as is indicated by those sentences where the past and present are contrasted. Thus if I say, "The English are a civilized nation," that does not indicate they always have been. "But," it may be objected, "the term 'English' here means 'the English of the year of our Lord 1930.'" Well, if this meaning is given to the word, the time element is smuggled into the noun, and that seems to give a new meaning to the traditional logic. But even if time is handled in the noun aspect of the proposition, it does not explain the contrast found in such sentences as, "The English are a civilized nation, but before the advent of Roman civilization they were not." As a matter of fact, the traditional logic gives no proper place to the time element as it is embodied in language, and is really embodied in our thought.

I think that this example indicates that the traditional logic assumed that language, at least in predicative sentences, was logical, in its sense of the word, without a careful investigation into the meanings that language does actually have. Now I think that it would have to be acknowledged that from no point of view can any one of our historical languages be considered merely or completely logical. But there is much logic embedded within language and it represents certain achievements in logical

analysis. Moreover it has a high power of logical precision. Now the tendency of traditional logic has been to ignore this really logical aspect of language and to miss its subtle power of expression by giving arbitrary meanings to words. In this way artificial schemes can be built up, but they are false to the historic meanings of words. We have seen this already in the misuse of the verb "is" in the traditional logic, and all other formal logics so far as I know. This is likewise true of the adjective "some," and because of its misuse, as it seems to me, a whole vista of logical meanings have been hidden from the inspection of both modern and ancient formal logicians.

We are told by the logicians that "some men" in the statement, "some men are negroes" means "one, at least, possibly all men." But is that what the word does mean? In normal usage the sentence definitely excludes the meaning, "all men are negroes," and tells us specifically that only part of mankind is composed of negroes. De Morgan is right when he tells us in his *Formal Logic* that "some" usually means "part of" and tends to have the meaning "a small part."² This indicates how far the word is from meaning "possibly all." It has been argued time and time again that if we give "some" its normal meaning, "the traditional square of opposition would be destroyed." I think not; but I do think that sentences that we have been terming contradictories are not really contradictory at all. There are sentences that do fit into the traditional scheme, and for these sentences the scheme is valid. The two sentences: "At least some heavenly beings are angels," and "No heavenly beings are angels" are true contradictories; but the sentences: "Some heavenly beings are

² Cf. p. 58.

angels," and "No heavenly beings are angels" are not contradictory.

I suppose it is now clear that I am suggesting that we need to recognize more forms of subsumptive propositions than the traditional four. But most logicians seem to consider them enough—including most, if not all the members, of all the schools of logic. I do not think that the simple quantitative notion "part of" can be reduced to "part, possibly all" and "part not, possibly none" as Dr. Keynes does.³ The notion "part of" is more simple and fundamental than the indefinite "part, possibly all." I contend that it needs a place in our logical system. Many of the present-day arguments against logic are really only arguments against its artificiality, and not against a more complete logic, and hence would fail if a logic richer in the necessary forms of expression should appear.

The traditional scheme of propositions deals with the quantitative aspects of the subjects of predicative sentences. There are many variations of the quantity of the predicate that are left unnoticed, and yet are exhibited in the language of literature and science. Sir William Hamilton suspected that this was true, but guided by the assumption that the predicate was always quantitative he lost the fruits of his insight. It was easily demonstrated that his conception of the meaning of the "A" proposition was false, and with this refutation it was thought that any expansion of the traditional group of four propositions must be false.

After studying Sir William's scheme I felt that there was germinal truth in his efforts to extend the number of propositional forms; but I felt that his principle was false, and that an empirical study of actual forms of usage was far superior to any such attempt as his, where

³ Cf. his *Formal Logic*, p. 101.

arbitrary methods were applied to actual linguistic usage. In other words, I searched for all possible examples of quantitative variations in both the subject and the predicate of the predicative sentences. After collecting these, I organized them, and searched for logical variations and principles involved. I found certain gaps in the scheme. Then I searched for examples that would cover, if possible, the deficiencies. After two years I have discovered the following forms exhibited in English usage. It may be that there are still other forms. I think that it would be rash to dogmatize as to other possibilities, since I recently discovered two forms that I thought did not appear in English; but it seems that only one or two more additional forms are probable.

In the diagrams I have used a modification of Leibniz's representation of the proposition. Euler's diagrams are unsuited to indicate all varieties of the quantities of the predicate, while Venn's and Carroll's diagrams indicate theories of the proposition that seem to me foreign to linguistic usage, at least as far as the "O" proposition is concerned.

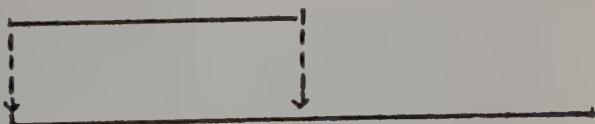
FORMS OF PREDICATIVE SENTENCES

UNIVERSAL AFFIRMATIVES

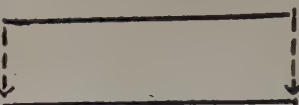
- (A) *All Xs are Y.*
(All angels are heavenly beings.)



- (A₁) *All Xs are part of Y.*
(All the Americans together are only part of the people of the world.)

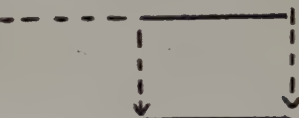


- (A₂) *All Xs are all Y. (X=Y)*
(Equiangular triangles alone are equilateral triangles.)

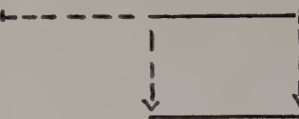


INDETERMINATE AFFIRMATIVES

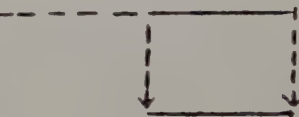
- (I) *At least some Xs are Y.*
(Some college students at least are educated.)



- (I₁) *At least some Xs are part of Y.*
(Some of us at least are among his friends.)

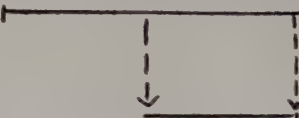


- (I₂) *At least some Xs are all of Y.*
(At least some of the forms of conifera make up all the vegetation of the island.)

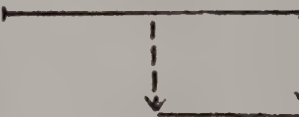


PARTICULARS

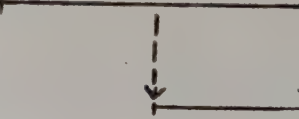
- (I') *Some Xs are Y.*
(Some Americans are Anglo-Saxons.)



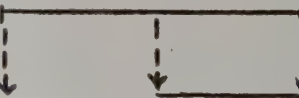
- (I'₁) *Some Xs are part of Y.*
(Some of the forms of conifera are part of the vegetation of the island.)



- (I'₂) *Some Xs are all of Y.*
(Some of my friends are all the friends he has.)



- (O') *Some Xs are not Y.*
(Some eggs are not fresh.)

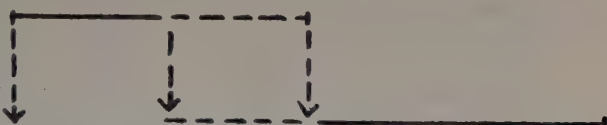


INDETERMINATE NEGATIVE

(O) *At least some*

Xs are not Y.

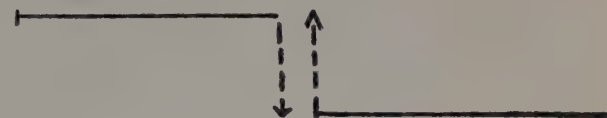
(Some South
Sea Islanders at
least are not edu-
cated.)



UNIVERSAL NEGATIVE

(E) *No Xs are Y.*

(No Africans
are Caucasians.)



It has often been said that an expansion of the propositional forms beyond the traditional four is of no advantage in inference. This is not strictly correct since it permits equational thinking, i. e., substitution of identities, as valid in formal non-mathematical reasoning. Also it allows the subject of the conclusion to be of definite quantity in three moods of the third figure, Datisi, Bocardo, and Ferison, and one mood of the first figure, Ferio.

Logicians have failed to realize the wealth of discrimination which our languages provide. We spoke above about the word "some." It is only one of the many words which may stand in a graded series between "all" and "none." Here are three such lists:⁴

I.	II.	III.
All	All	All
Many	Much	
A Few } (some)	A Little } (some)	Some
Few	Little	
None	None	None

Notice in I and II the delicacy of discrimination in indicating the amount of the proportional quantity. The word "some" is more indefinite than these words. Is

⁴ Cf. Jespersen, *The Philosophy of Grammar*, p. 324.

such definiteness illogical? And if logical, do not these words deserve a place in our logic, alongside of the more indefinite word "some"?

We have been inclined to think that the whole scheme of propositions should be very simple, and that the very simplicity of the thing was a proof of its truth. And yet a careful study of language seems to reveal a range of complexity in logical discriminations that exceeds anything of which we have dreamed. Let us examine one such phase of the logic which language has indicated, but which we have not yet noticed, as logicians. Suppose we examine the general list of quantitative terms,

All

Some

None

It is interesting to notice that if we negate either of the absolute terms, *All* or *None*, we get the meaning "some." "Not all" means "some," and "Nonulli" in Latin also means "some." English does not allow the negation of a negative in such cases. If the absolutes, "All" or "None," are negated the absolute aspect is destroyed, and the meaning "some" is produced. This is only a sample of the interesting developments of logic indicated by language itself.

Let me conclude with the exposition of a very ancient dilemma in accordance with Professor Jespersen's interpretation of it. Our logic books all give us that ancient sophism of Epimenides the Cretan, who says that all Cretans are liars. Thus he is himself a liar; hence his own statement is a lie, and Cretans are tellers of the truth, and even he is in his statement that all Cretans are liars. This dilemma is due to the logicians' false interpretation of language. There is no ambiguity in the term "liar"

as the exponents of the sophism assume. "Liar" does not mean an individual who always and without exception lies, any more than "preacher" means one who does nothing but preach, or a singer who only sings and never talks or whistles. Hence when a man is called a liar, it does not preclude the possibility of his occasionally telling the truth. It may even be that if a man is called a liar it is only implied that he sometimes lies. Thus the old dilemma was based upon a false use of language.⁵

⁵ Cf. Jespersen, *Logic and Grammar*, p. 5.

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A NEW TREATMENT OF THE THEORY OF INFERENCE

1. Mathematical investigations about the infinite have led to antinomies the elimination of which requires a thorough revision of the fundamental principles of logic. Now since the main weapon in this fight against inconsistencies is clear reasoning, the process of logical inference has to be carefully analysed, and put into a convenient symbolic form, in order that every step may be revised as easily as possible.

Formal logic, in particular in the form worked out by Whitehead and Russell in their *Principia Mathematica*, is a general theory of statements, which has recently been presented in the first chapter of Hilbert and Ackermann's *Grundzüge der theoretischen Logik*. In this theory the particular content of statements is systematically ignored, only the truth or falsehood, the *truth-value* of statements being taken into account.

The leading ideas of this theory may be summarised as follows. A thing which is either true or false is said to be a statement. A third possibility is not excluded, but then the thing is not called a statement. Thus the theory in question is the theory of either-or.

A group of two statements A and B is not a statement until a convention is given assigning truth (T) or falsehood (F) to the group. We may agree, for example, that the group (A,B) is true only if both A and B are true; or that

(A, B) is true if either A or B is true. There are altogether 16 different ways of making (A, B) a statement and these are given in the following table where $\overset{+}{A}$ indicates that A is true and $\tilde{A}$ indicates that A is not true.

TABLE I.

Number of Convention	$\overset{+}{A}, \overset{+}{B}$	$\overset{+}{A}, \tilde{B}$	$\tilde{A}, \overset{+}{B}$	$\tilde{A}, \tilde{B}$	Symbols for the group-statements
(1)	T	T	T	T	
(2)	T	T	T	F	AB
(3)	T	T	F	T	$A \rightarrow B$
(4)	T	F	T	T	$B \rightarrow A$
(5)	F	T	T	T	
(6)	T	T	F	F	
...	...	...	...	...	
(12)	T	F	F	F	$A+B$
(13)	F	T	F	F	
(14)	F	F	T	F	
(15)	F	F	F	T	
(16)	F	F	F	F	

If we have a group of three statements these yield 8 instead of 4 different cases, and thus lead to $2^8 = 256$ different conventions for transforming the group into a statement. Similarly for higher groups.

 The first and last conventions seem to be devoid of interest, leading to always-true and never-true statements. Curiously enough, however, in the formal construction of this logic these two kinds of statements play an important part not altogether different from that of ∞ and 0 in Mathematics. The chief object aimed at by Whitehead and Russell in their theory of mathematical sciences can be expressed by saying that they try to reconstruct fundamental mathematical ideas exclusively by means of always-true statements.

 This general but rather empty theory of truth-values is further developed by adding to the truth-values fresh characteristics of statements referring necessarily to their content. The *Principia Mathematica* contains an exhaust-

tive formal analysis of existential and universal statements (there is an element belonging to the class a , every a is b).

It has not always been realised that as soon as we touch the content of statements we are dealing with particular classes of statements. Moreover, different kinds of relations between subject and predicate may require as many different symbolics. In science for example, and especially in mathematics, symbols and symbolic relations are grown out of the relations to be represented.

Everybody seems however to agree that the process of inference is carried out by confronting relations between classes or genera. Therefore I am putting forward in this paper *a theory of inference based exclusively on the properties of class-relations*. The chief object of the investigation is to clear the position for a thoroughgoing analysis of the principles involved. For this purpose I present the theory of inference as a special case of relations between statements about classes.

2. *Statements about classes.*

Two non-empty classes a and b are, with respect to one another, in one of the five mutually exclusive relations:

1/. Every element of a is an element of b and b has an element not belonging to a . This is represented by $a < b$.

2/. Every element of b is an element of a and a has an element not belonging to b : $a > b$.

3/. a and b have the same elements: $a = b$.

4/. a and b are mutually overlapping: $a \leq b$.

5/. a and b have no common element: a/b .

Formally we define classes as things having this property.

Our information however about the relation of the two classes a and b may not be complete. We may only know that a and b are not in the relation 3/., say. Or we may know that two definite cases are excluded, and so forth. The complete list of all possible types of information con-

tains $2^5 = 32$ cases, i.e. there are 32 different statements about the relation between two non-empty classes. If we denote exclusion by F (false), and "this is the case" by T we obtain the following table:

TABLE II.

	$a < b$	$a > b$	$a = b$	$a \gtrless b$	a / b	
(1)	F	F	F	F	F	either a or b is not a class.
(2)	T	F	F	F	F	$a < b$.
(3)	F	T	F	F	F	$a > b$.
(4)	F	F	T	F	F	$a = b$.
(5)	F	F	F	T	F	$a \gtrless b$.
(6)	F	F	F	F	T	a / b .
(7)	T	T	F	F	F	
(25)	F	T	F	T	T	some a is not b.
(27)	T	T	T	T	F	some a is b, some b is a.
(28)	T	T	T	F	T	
(29)	T	T	F	T	T	
(30)	T	F	T	T	T	
(31)	F	T	T	T	T	
(32)	T	T	T	T	T	both a and b are classes.

This table reads as follows. By convention (2) we mean that if the given a and b are in the relation $a < b$, the statement is true; and if a and b are in any of the other four relations, the statement is false, i.e. we state that $a < b$ and deny the other relations. By convention (7), we mean that the statement is true if either $a < b$ or $b < a$, and false in the other three cases. And so on.

Since the denial of existence is unavoidable in logic, the non-existence, i.e. the empty class, must be included among the possibilities. The introduction of the empty class gives rise to three new relations between two classes a and b: 1/. Both are non-existent; 2/. a is non-existent, b is existent; 3/. a is existent, b is non-existent.

For a complete survey of these eight relations we denote as usual by ab the common part of a and b, by $\bar{a}b$ or

$\bar{b}a$ the part of b that is not in a . Existence of any class a is denoted by $a > 0$ and non-existence by $a = 0$.

TABLE III.

(r_1)	$a\bar{b}=0.$	$ab=0.$	$\bar{a}b=0$	$a=0.$	$b=0$
(r_2)	$a\bar{b}=0.$	$ab=0.$	$\bar{a}b>0$	$a=0.$	$b>0$
(r_3)	$a\bar{b}=0.$	$ab>0.$	$\bar{a}b=0$	$a=b>0$	
(r_4)	$a\bar{b}=0.$	$ab>0.$	$\bar{a}b>0$	$0<a<b$	
(r_5)	$a\bar{b}>0.$	$ab=0.$	$\bar{a}b=0$	$a>0.$	$b=0$
(r_6)	$a\bar{b}>0.$	$ab=0.$	$\bar{a}b>0$	$a/b.$	$a>0, \quad b>0$
(r_7)	$a\bar{b}>0.$	$ab>0.$	$\bar{a}b=0$	$0<b<a$	
(r_8)	$a\bar{b}>0.$	$ab>0.$	$\bar{a}b>0$	$a\geq b$	

Possessing some information about the relation between two classes a and b means the exclusion, for the given a, b , of one or several of the eight cases. If we know that seven are excluded, our information is complete provided we know that both a and b are classes. We know, in fact, which of the eight possible relations between a and b is actually realised in the case in question. Writing the eight relations in a row, we can, on the analogy of Table I assign T or F to everyone of them in $2^8=256$ different ways. Thus the logic of two classes, if it includes the empty class, contains 256 different statements. Denoting by 0 exclusion and by 1 admission of one of the relations in Table III, every statement can be symbolised by S (meaning statement) followed by eight spaces filled with 0 or 1. For example, S (0,0,0,0,0,1,0,1) means that both a and b are existent and that they are either distinct or mutually overlapping: a and b are either in the relation r_6 or in the relation r_8 .

We notice however that exchanging a and b we only look at the same relation from the side of b . For example both r_2 and r_3 state that one of the two classes in question exists and the other does not. Similarly $a < b$ and $a > b$ state that one of the two classes is a part of the other. We

say that r_i is the *transposed* of r_k if we obtain r_i from r_k by exchanging a and b . The relations r_2 and r_3 and the relations r_7 and r_4 are the transposed of one another. The other four relations are identical with their transposed forms. Thus we obtain six essentially different relations and correspondingly $2^6 = 64$ different statements.

Three classes a, b, c determine seven parts $\overline{abc}, \overline{abc}, abc, \overline{abc}, \overline{abc}, \overline{abc}, \overline{abc}$; the eighth, $\overline{abc}$, being rejected as meaningless. Everyone of these distinct parts may be existent or non-existent. Thus the eight cases of Table III are replaced in this case by $2^7 = 128$ cases and information about the relation between three given classes a, b, c means that certain of these 128 cases are excluded. Therefore there are 2^{128} different statements about the relation between three classes.

Similar considerations apply to more than three classes. To simplify our problem we shall make use of the ordinary symbolics for classes.

3. *Algebra of classes.* The combination of two or more statements about classes can be dealt with by the general method given in Section 1. We shall replace this method however, by the direct combination of classes which enables us to attain to considerable formal simplifications. For this purpose we denote, as usual, by the "sum" $a+b$ the united class, common elements taken only once; and by the "product" ab the class of common elements. The "obvious" properties of sum and product of classes are contained in the following list:

The laws of addition and multiplication of classes.

- | | | |
|-----|---------------------|--------------------|
| (1) | $a+b = b+a$ | } commutative law |
| (2) | $ab = ba$ | |
| (3) | $a+(b+c) = (a+b)+c$ | } associative law |
| (4) | $a(bc) = (ab)c$ | |
| (5) | $a(b+c) = ab+ac$ | } distributive law |
| (6) | $a+bc = (a+b)(a+c)$ | |
| (7) | $a0 = 0$ | product law |

The laws of inequality (implication).

(8) $a+b+c \dots > 0$ implies that at least one of the classes $a, b, c, \dots$ is not empty.

(9) $abc \dots > 0$ implies that $a > 0, b > 0, c > 0, \dots$

We notice that for every class, $a \geq 0$ so that $a \leq 0$ means $a = 0$.

Law of substitution.

(10) If $a = b$, a and b can replace one another in every statement.

Negated classes.

For further simplification, and also to imitate the structure of ordinary sentences, we use the symbol $\bar{a}$ in the meaning "not in a " but only as a factor in a product containing a non-barred class-factor. This restriction is introduced in order to avoid the use of the principle of excluded middle. In this way we use negation only in the restricted sense: "not in a " and exclude the use of "non- a " as a class. Thus $a\bar{b} = \bar{b}a$ denotes the part of a which is not in b . If $b = 0$, we put $a\bar{b} = a$. If $a = 0$, we put $0\bar{b} = 0$, so that the statement, $a\bar{b} = a$, or $\bar{b}a = b$, is fully equivalent to $ab = 0$.

The rules for barred symbols are as follows.

(11) $(a\bar{b})c = a(\bar{b}c) = a\bar{b}c = \bar{b}ca$ commutative law

(12) $(a+b)\bar{c} = a\bar{c} + b\bar{c}$ distributive law

We notice that $a + \bar{b}$ has no meaning for us.

(13) $a < b$ implies $a\bar{c} \geq b\bar{c}$

In certain cases equality is not introduced after multiplication. For instance when we multiply with the barred smaller term: $a < b$ leads to $0 < b\bar{a}$ because, by hypothesis, b has an element not-in- a . The same holds when we multiply by $\bar{c}$ where $c \leq a$. Finally

(14) $a\bar{a} = 0$.

4. *Forms, equations and inequalities of classes.* A finite number of classes $a_1, a_2, \dots, a_n$ given, the result of a finite number of additions, multiplications and barring of $a_1, a_2, \dots, a_n$ is said to be a *form* $f(a_1, \dots, a_n)$ in $a_1, \dots, a_n$.

There are only eight different (not identical) forms in two classes a and b , viz. (1) $a, b, a+b; a\bar{a} = b\bar{b} = 0, ab, \bar{a}b, a\bar{b}, \bar{a}\bar{b} + a\bar{b}$.

$a\bar{b}$ is not admitted.

Proof. The linear forms are exhausted by the first three. The bilinear forms that do not figure in (1) are all identical to one of (1). E.g., $ab + \bar{a}b = b$, $a\bar{b} + \bar{a}b + b = a\bar{b} + b = a + b$, etc. Finally, multiplying any of the forms (1) by a , $\bar{a}$, b , or $\bar{b}$, we obtain in every term either a factor aa or $b\bar{b}$ reducing the term to 0, or a factor $aa = a$, $bb = b$ leading to the same term.

The seven non-zero forms of (1) correspond to the seven regions we can form by uniting any two or all the three of the regions $a\bar{b}$, ab , $\bar{a}b$ and the empty class.

For three classes we obtain in a similar way 128 different forms, and so forth.

An equation in a , b , i.e. two forms in a , b connected by the sign $=$, is said to be satisfied by one of the relations r_i of Table III when the statement expressed by the equation in question is true whenever a and b are in that relation. For example, $a + b = 0$ is satisfied only by r_1 ; $\bar{a}b + a\bar{b} = 0$ is satisfied only when a and b are in the relation r_1 or r_3 ; $a = ab$ is satisfied when a and b are in the relation r_1 , or r_2 , r_3 , r_4 .

The meaning of any logical equation in two classes is easily interpreted in terms of the three subclasses $a\bar{b}$, ab and $\bar{a}b$ denoted for our present purpose by 1, 2, 3. The letters i , j , k will denote any of the numbers 1, 2, 3, and when they occur in the same equation they are supposed to be different so that i , j , k is a permutation of 1, 2, 3.

In this symbolism the seven non-zero forms of (1), in a different order, are: 1, 2, 3, $1+2$, $1+3$, $2+3$, $1+2+3$. Equating any of them to 0, we state that one or two or all the three of 1, 2, 3 are 0. Equating any of the seven non-0 forms to any other we obtain 1/. equations $i=j$ or $i=j+k$ where the same number does not figure twice. 2/. Equations $i=i+j$, $i=i+j+k$ where one at least of the numbers 1, 2, 3 figures on both sides.

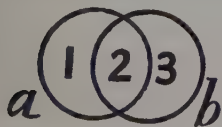
Equation $i=j$, e.g. $1=2$, is satisfied when both a and b are 0 and when $a=0$ and b is any class, i.e., $i=j$ is satisfied only by r_1 and r_2 . The equation $i=j+k$ is satisfied only when $a=0$ and $b=0$, i.e. by r_1 . Two existent classes cannot satisfy an equation of the first type.

The equation $i=i+j$ means that $j=0$, $i=i+j+k$ means that $j+k=0$, i.e. $j=0$ and $k=0$. An equation of the second type is a statement that one or two of 1, 2, 3 are empty, i.e., excludes four or six of the eight cases of II and is satisfied by the other relations.

Inequalities.

$i < 0$ absurd, i.e. not satisfied by any class-relation

$i < j$ absurd unless $i=0$ when it states the existence of j



$i < j + k$ $\begin{cases} \text{if } i > 0, \text{ absurd} \\ \text{if } i = 0, \text{ states alternative existence for } j, k: j + k > 0 \end{cases}$
 $i < i + j + k$ fully equivalent to $j + k > 0$
 $i + j < k$ $\begin{cases} \text{if } i = 0, j = 0, \text{ states the existence of } k: k > 0 \\ \text{if } i \text{ or } j \text{ is } > 0, \text{ absurd} \end{cases}$
 $i + j < i + k$ equivalent to $j < k$
 $i + j < i + j + k$ equivalent to $k > 0$
 $i + j + k < 0$ absurd for all the seven values of the right hand side
 $i + j + k > 0$ states alternative existence for 1, 2, 3.

To sum up, (i) an equation states that one or two or all the three of 1, 2, 3 are empty (ii) an inequality, if not absurd, states the existence of one of 1, 2, 3 or else the alternative existence of two or three of the subclasses 1, 2, 3.

5. *Consequences.* An equation or an inequality in a, b , as we have seen, states the non-existence of one or two or all the three of the sub-classes $a\bar{b}$, ab , $\bar{a}b$ or the existence of one or the alternative existence of two or all the three of the same sub-classes. Therefore *every statement about the relation between a and b can be expressed by alternative or simultaneous formulae* (equations and inequalities) *in a and b .* A relation is said to satisfy a system of alternative formulae if it satisfies one of the equations or inequalities of the system. Also in mathematics the two equations $ax + by + cz + d = 0$ and $a^1x + b^1y + c^1z + d^1 = 0$ may be regarded as defining two planes or they may be regarded simultaneously as defining the common points of the two planes. In the general case a system of logical formulae contains both alternative and simultaneous groups of formulae. The solution of such a system in two classes means the determination of the relations $r_1, \dots, r_8$ satisfying the system (or those not satisfying the system). In other words, to solve a system means to identify the system with one of the 256 statements or to show that the system is absurd. If all the solutions of a system S^1 are solutions of S , we say that S^1 is a *consequence* of S . They are *equivalent* if they have exactly the same solutions.

The word "implication" in Art. 3 can be interpreted as "consequence." For example the sentence: $a + b > 0$ implies that either $a > 0$ or $b > 0$ (or both) means that the set of alternative formulae $a > 0, b > 0$ is a consequence of the formula $a + b > 0$, i.e. when a and b are in the relation satisfying $a + b > 0$, the same relation satisfies $a > 0$ or $b > 0$.

The same considerations apply when we have more than two classes. For the theory of inference in the usual sense of the word only the case of three classes is needed. A system of statements about a, b, c may have consequences not containing b . In syllogistic reasoning also the premises are specified statements, one about a and b and the other about b and c . A characteristic feature of the statements admitted in syllogistic reasoning is that they *exclude four of the relations* $r_1, \dots, r_8$ *and admit the other four cases*. We shall call such statements *dichotomic*. There are $\binom{8}{4} = 70$ dichotomic statements and six of them, viz.:

$a\bar{b} = 0,$	all a is b
$ab = 0,$	no a is b , no b is a
$\bar{a}b = 0,$	all b is a
$a\bar{b} > 0,$	some a is not b
$ab > 0,$	some a is b , some b is a
$\bar{a}b > 0,$	some b is not a

are expressed without alternative formulae. We shall call the last six statements *simple dichotomic*. Thus the *scope of the Aristotelian theory of inference (syllogistic reasoning) is the determination of simple dichotomic consequences in a, c of two statements (premises) one of which is a simple dichotomic statement in a and b and the other in b and c .*

Three classes a, b, c determine seven fundamental forms (2.1) and thus for three classes there are fourteen simple dichotomic statements, viz. any of the seven forms (2.1) equated to 0 or followed by > 0 .

6. *The Aristotelian theory of inference.* The first premise is one of the six statements $a\bar{b} \geq 0, ab \geq 0, \bar{a}b \geq 0$. The

second premise is one of the six statements $bc \geq 0$, $bc \geq 0$, $\bar{b}c \geq 0$ and the conclusion is one of the six statements $a\bar{c} \geq 0$, $ac \geq 0$, $\bar{a}c \geq 0$. We have inverted the usual order of the premises. There are 36 combinations for the two premises: 9 consisting of two equations 18 consisting of an equation and an inequality and 9 consisting of two inequalities.

We illustrate our method of obtaining the valid syllogistic moods by the example of Barbara: $a\bar{b} = 0$, $b\bar{c} = 0 \mid a\bar{c} = 0$. (In our symbols it is convenient to change the order of the two premises.) Among the seven fundamental forms of three classes only four are affected by the premises. It follows, namely, from $a\bar{b} = 0$ that $a\bar{b}c = 0$, $a\bar{b}\bar{c} = 0$. Similarly $abc = 0$, $\bar{a}bc = 0$. Thus four of the seven regions determined by three classes are empty. If two of them give one of the regions determined by a and c , viz. $a\bar{c}$, ac , or $\bar{a}c$, we conclude that this region is empty which is a dichotomic statement. For this purpose we have to join one of the two regions $a\bar{b}c$, $a\bar{b}\bar{c}$ to one of the two regions abc , $\bar{a}bc$. In our case $a\bar{b}c + a\bar{b}\bar{c} = a\bar{c}$ and thus the conclusion is $a\bar{c} = 0$.

This is however not the only conclusion in which b does not figure. For example it follows from $a = ac + a\bar{c}$ that $a = ac$, but this is not a dichotomic conclusion. In the transposed (a and c exchanged) form of the mood called Bramantip we are asked to conclude that $ac > 0$ which would be a second dichotomic conclusion. The last step however supposes that $a > 0$, i.e. involves a special, not dichotomic hypothesis. In ordinary logic it is usually understood that all the classes dealt with satisfy the condition in question, i.e. the empty class is excluded. Then, of course, $a\bar{b} = 0$, $b\bar{c} = 0 \mid ac > 0$ is a valid mood. For the time being we disregard these secondary moods.

Two inequalities as premises do not lead to any simple dichotomic conclusion. In fact taking $a\bar{b} > 0$, $b\bar{c} > 0$ for an

example, all we know of the seven constituent parts of $a+b+c$ is that *either* $\overline{a}bc$ or $a\overline{b}c$ is >0 and that either $\overline{a}b\overline{c}$ or $a\overline{b}\overline{c}$ is >0 . Joining $\overline{a}bc$ and $a\overline{b}c$ we obtain $\overline{a}c$ as before but according to the premises both of these parts may be 0 and thus we cannot conclude that $\overline{a}c > 0$. The reasoning is general: from two alternative existences, existence for the sum does not follow necessarily.

Therefore we have to consider only 27 cases. However, the two reasonings $\overline{a}b=0, \overline{b}c=0 \mid \overline{a}c=0$ and $\overline{b}a=0, \overline{c}b=0 \mid \overline{a}c=0$ (a and c exchanged) are not really different since we aim at results valid for any pair of classes. Hence the reasoning must hold when both a and c are arbitrary classes. In particular, a may be c and c may be a . We shall say that the second mood is the *transposed* of the first so that transposition means exchanging a and c and changing the order of the premises (their order is irrelevant). This reduces the 9 cases in which both premises are equations to 6 and the 18 other cases to 9, viz.

1. $\overline{a}b=0, \overline{b}c=0$. 2. $\overline{a}b=0, bc=0$. 3. $\overline{a}b=0, \overline{b}c=0$.
4. $ab=0, \overline{b}c=0$. 5. $ab=0, bc=0$. 6. $\overline{a}b=0, \overline{b}c=0$.

and all the cases in which the first premise is an equation and the second an inequality.

We have dealt with case 1. Case 2 gives $\overline{a}bc=0, \overline{a}b\overline{c}=0$; $abc=0, \overline{a}bc=0$ and leads to $\overline{a}bc+abc=ac=0$ (Celarent). In the following four cases two of the four regions coincide and the other two do not lead to any of the three regions $\overline{a}c, ac, \overline{a}c$. Therefore they do not yield any dichotomic conclusion.

Now consider $\overline{a}b=0, \overline{b}c > 0$. We have $\overline{a}bc=0, \overline{a}b\overline{c}=0$; $\overline{a}bc+\overline{a}b\overline{c} > 0$. Since $\overline{a}bc$ may be 0 or may be >0 , it is useless to unite it to $\overline{a}b\overline{c}$ in order to form $\overline{a}c$. We obtain a dichotomic conclusion only when a region of the first group coincides with a region of the second group so that the inequality reduces to a simple dichotomic statement. Then we complete the non-empty region to one of the

three regions $\overline{ac}$, ac , $\overline{ac}$. We readily see that this condition is verified only in the following four cases:

$$\begin{array}{lll} a\overline{b}=0, & \overline{b}c>0 & \text{leading to } \overline{ac}>0 \\ ab=0, & bc>0 & \text{leading to } \overline{ac}>0 \\ \overline{a}b=0, & \overline{b}c>0 & \text{leading to } \overline{ac}>0 \\ \overline{a}b=0, & bc>0 & \text{leading to } ac>0 \end{array}$$

Formal proof of the first case. (i) if $a=0$, we have form $\overline{ac}=\overline{ac}+ac=c>0$, since by the second premise, $c>0$, (ii) if $a>0$, we have $\overline{bc}=a\overline{b}c+\overline{a}bc>0$, by the second premise and the first term vanishes by the first premise so that $\overline{abc}>0$, i.e. $\overline{ac}>0$ by (3.9). Q.e.d.

Similar proofs for the other cases.

We collect the valid moods with their transposed moods in Table IV.

TABLE IV.

1.	$a\overline{b}=0$,	$\overline{b}c=0$	$a\overline{c}=0$	Barbara
2.	$a\overline{b}=0$,	$bc=0$	$ac=0$	Celarent, Cesare
3.	$a\overline{b}=0$,	$\overline{b}c>0$	$\overline{ac}>0$	
4.	$ab=0$,	$bc>0$	$\overline{ac}>0$	
5.	$\overline{a}b=0$,	$\overline{b}c>0$	$a\overline{c}>0$	Bocardo
6.	$\overline{a}b=0$,	$bc>0$	$ac>0$	Disamis, Dimaris
1a.	$\overline{a}b=0$,	$\overline{b}c=0$	$\overline{ac}=0$	
2a.	$ab=0$,	$\overline{b}c=0$	$ac=0$	Camestres, Camenes
3a.	$a\overline{b}>0$,	$\overline{b}c=0$	$a\overline{c}>0$	Baroco
4a.	$ab>0$,	$bc=0$	$a\overline{c}>0$	Ferio, Festino, Ferison, Fresison
5a.	$\overline{a}b>0$,	$\overline{b}c=0$	$\overline{ac}>0$	
6a.	$ab>0$,	$\overline{b}c=0$	$ac>0$	Darii, Datisi

Grammatically the relation $ab=0$ can be expressed in two fully equivalent ways: no a is b and no b is a . Similarly $ab>0$: some a is b and some b is a . Since these two grammatical sentences describe the *same logical relation*, there is no reason whatever to consider Ferie, Festino, Ferison and Fresison as different moods. *All the four moods have the same logical relations between a , b and b , c for their premises and lead to the same logical relation between a and c .*

Similar remark applies to Celarent and Cesare, Disamis and Dimaris, Camestres and Camenes, Darii and Datisi.

We also notice that some of the accepted moods are transposed of one another like Celarent and Camestres and some of the transposed moods are omitted (those of Barbara, Baroko, Bocardo and Ferio) because the conclusion cannot be formulated in the accepted sentence-form having a for its subject.

7. *Secondary syllogistic moods of Aristotelian logic.* We have in the preceding article accounted for 15 of the 19 accepted moods. In dealing with Barbara we have seen that the transposed Bramantip is valid only if $a > 0$ or if we generally suppose that all the classes dealt with are existent. We obtain all the secondary moods in a similar way.

The conclusion of IV.1 yields $ac > 0$ if $a > 0$: that of IV.2 gives $a\bar{c} > 0$ if $a > 0$ and $\bar{a}c > 0$ if $c > 0$. If the premises contain an inequality, we change it into an equality by suppressing the bar or by barring either b or c and by supposing that b or c , as the case may be, is different from zero and thus we obtain the conclusion of the same mood. Thus $a\bar{b} = 0$, $bc = 0$ leads to IV.3 if we suppose that $b > 0$, i.e. we obtain the mood: $a\bar{b} = 0$ $bc = 0 | \bar{a}c > 0$.

In the case of IV.4, $b\bar{c} = 0$ leads to

III.4 if $b > 0$ and $\bar{b}c = 0$ leads to IV.4 if $c > 0$. Similarly III.5 yields

$a\bar{b} = 0$, $bc = 0 | \bar{a}c > 0$ if $b > 0$ and IV.6 yields

$\bar{a}b = 0$, $b\bar{c} = 0 | ac > 0$ if $b > 0$, and

$\bar{a}b = 0$, $\bar{b}c = 0 | ac > 0$ if $c > 0$.

Similarly for the transposed moods. Thus we obtain the table of secondary moods with their transposed forms:

TABLE IV.A

- | | | |
|-----|---|-------------------|
| 7. | $a\bar{b} = 0$, $b\bar{c} = 0 ac > 0$ if $a > 0$ | weakened Barbara |
| 8. | $a\bar{b} = 0$, $bc = 0 ac > 0$ if $a > 0$ | weakened Celarent |
| 9. | $a\bar{b} = 0$, $b\bar{c} = 0 \bar{a}c > 0$ if $c > 0$ | |
| 10. | $ab = 0$, $b\bar{c} = 0 \bar{a}c > 0$ if $b > 0$ | |
| 11. | $\bar{a}b = 0$, $b\bar{c} = 0 ac > 0$ if $b > 0$ | Darapti |

- 7a. $\bar{a}b=0, \bar{b}c=0 | \bar{a}c > 0$ if $c > 0$ Bramantip
 8a. $ab=0, \bar{b}c=0 | \bar{a}c > 0$ if $c > 0$
 9a. $ab=0, \bar{b}c=0 | \bar{a}c > 0$ if $a > 0$ weakened Camestres or Camenes
 10a. $\bar{a}b=0, bc=0 | \bar{a}c > 0$ if $b > 0$ Felapton, Fesapo
 11a. $\bar{a}b=0, \bar{b}c=0 | \bar{a}c > 0$ if $b > 0$ Darapti

In traditional logic, moods containing $\bar{a}$ in their conclusion have been ignored since a cannot be the subject of the conclusion if we keep to the four accepted forms of sentence. Thus Table IV gives eight logically different moods and Table IVa gives six logically different moods (since Darapti is its own transposed). From the latter six moods the three weakened moods are usually considered. Therefore, for non-empty classes, we obtain eleven not weakened moods with a as the subject in the conclusion. If we add the eight moods which differ only grammatically from other moods, we obtain the 19 moods of scholastic logic.

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P. DIENES.

NOTES AND NEWS

By a gift of the late Edgar Pierce, Ph. D. Harvard 1895, and author of "The Philosophy of Character," a Lectureship in honor of William James has been established in Harvard University. Dr. Pierce was at one time Instructor in Psychology at Harvard and later a member of the Visiting Committee for the Department of Philosophy and Psychology. Appointments to this Lectureship will be made at least biennially, the appointees being in residence at the University and participating in the regular instruction. Professor John Dewey will be the first lecturer on this foundation. During the spring term beginning February 1931, he will deliver a series of ten public addresses on a topic not yet announced. The subjects covered in the William James Lectures are not limited in any way, beyond the general condition that they must fall within the field of philosophy and psychology. The lectures will appear in book form.

The Seventh International Congress of Philosophy will meet, September 1st to 5th, 1930, at Oxford, England. The programme of the Congress will be as follows:—

A.—GENERAL PLAN.

Monday Evening, September 1st—

Opening Meeting. Addresses of welcome, and reply by Representative of Foreign Delegates.

Tuesday, Wednesday, Thursday and Friday, September 2nd to 5th— Mornings, 9:30—12:30.

Simultaneous Section Meetings in all Four Divisions.

Tuesday Afternoon.

General Session. Division A.

Wednesday Afternoon.

General Session. Division B.

Thursday Afternoon.

General Session. Division C.

Thursday Evening.

Business meeting.

Friday Afternoon.

General Session. Division D.

B.—SESSIONS.

Division A - - Metaphysics—General Session.

Subject: Are recent advances in physics of metaphysical importance?

Section 1.

Subject: Is a philosophy of history consistent with the facts of history?

Section 2.

Subject: Must biological processes be either purposive or mechanistic?

Section 3.

Subject: The relations between Metaphysics and Religion.

Section 4.

Subject: Open Session.

B.—SESSIONS—Continued.**Division B - - Logic and Epistemology—General Session.**

- Subjects: (a) The value of recent contributions to Logic.
(b) Phenomenology.

Section 1.

- Subject: The nature of perception and of its objects.

Section 2.

- Subject: The nature and source of non-perceptual factors in thinking.

Section 3.

- Subject: The relation of scientific thinking to the ideal of knowledge.

Section 4.

- Subject: Open Session.

Division C - - Ethics, Politics and Aesthetics—General Session.

- Subject: The value of Ethical and Political Philosophy as guides in practice.

Section 1.

- Subject: Is the distinction between moral rightness and wrongness ultimate?

Section 2.

- Subject: Is the ground of political obligation always one and the same?

Section 3.

- Subject: Recent suggestions in the theory of Fine Art.

Section 4.

- Subject: Open Session.

Division D - - History of Philosophy—General Session.

- Subject: In what respects has Philosophy progressed?

Section 1. Subsection (a) Ancient Philosophy.

- Subject: What is alive and what is dead in the Philosophy of Classical Antiquity?

Subsection (a) Mediæval Philosophy.

- Subject: The philosophical problems at issue in the XIIIth and XIVth Centuries.

Subsection (c) Oriental Philosophy.

- Subject: What contributions have been made to Philosophy by Eastern Philosophers (including Jews and Western Arabs)?

Section 2. Philosophy of the XVIIth and XVIIIth Centuries.

- Subject: Has Kant by the introduction of his transcendental method rendered the study of his predecessors unnecessary?

Section 3. Philosophy of the XIXth and XXth Centuries.

- Subject: Open Session.

SOME RECENT BOOKS

The Theory of Morals: An Introduction to Ethical Philosophy. By E. F. CARRITT. Oxford University Press, 1928. Pp. xii+144.

With a clarity that triumphs over severe brevity and closely reasoned argument, the present exposition develops the author's conclusions through the method of stating and criticising the more important ethical theories in their natural, as contrasted with their historical, order. It begins, that is to say, with the crudest theory and shows how this fails to satisfy; this then is replaced by another, which itself in turn suffers the same fate. Thus we are carried progressively from the doctrines of hedonism to those of evolutionary ethics, utilitarianism, perfectionism, self-sacrifice and self-realization, and the common good. Central to the conclusions finally reached are the following theses: "If we do what we think wrong or fail to do what we think right we act *immorally*, and the *guilt* is in proportion to our clear consciousness of stringency in the obligation. If we do the act that we think right, and do it for that reason simply, we act *morally*, and the *merit* is in proportion to the strength of the desires resisted. Moral and immoral acts are spontaneous acts of choice: they are free in the fullest sense. If, however, we do the act that we think right simply because we desire to do it (apart from thinking it right) more than we desire not to do it or to do anything inconsistent with doing it, I should not call the act moral. When the desire that we act upon is of a kind that usually leads to right acts, and therefore ought to be encouraged, I call it a *virtuous* act. When, on the other hand, the desire is of a kind that usually leads to wrong acts, and therefore ought to be discouraged, I call it, for lack of a proper name, a *vicious* act."

Personality and Immortality in Post-Kantian Thought. By Ernest G. Braham. London, George Allen & Unwin, Ltd., 1926. Pp. 246. 7s.6d.

The first part of this volume is a more or less sketchy and disjointed account and critique of the views of McTaggart, Bradley, Bosanquet, Lotze, James and Ward; the second, concludes from an independent analysis that the self is "a unified system possessing reality, that it dominates the body, that it increases in independence in its evolution, and finally may be capable of existing apart from the body." That the self does so exist is argued on the ground that (a) the persistence of personal life is necessary if moral values are to be conserved and justice is to be vindicated; (b) man's moral life of the here and now remains incomplete, and the most reasonable interpretation is that the instant endeavor to realize the good points to the fact of immortality; (c) immortality is bound up with a theistic philosophy as expressed in the doctrine of God as Love—indeed, "as soon as we are brave enough to accept the revelation of God the belief in personal immortality is secure." As a whole, the study, which is part of a doctoral dissertation, scarcely exhibits an independent grasp of the philosophies it expounds or a realization of the profounder problems connected with the interpretation of personality in its bearing upon the question of immortality.

Methods of Private Religious Living. By Henry Nelson Wieman. New York, The Macmillan Co., 1928. Pp. 218. \$1.75.

Forged in the fire of his own experimental living, as the author declares them to have been, and tested by the processes of sober reflection, the methods of worship and of securing the power and joy of religious life here set forth should be of great value to all who seek a fuller integration of personality in harmony with the social world and the wider cosmos. Manifest within the cosmos are potent tendencies toward progressive integrations, and the battle front has reached the frontiers of those associations called human society. "Religion of the noblest kind is man's recognition of this creative cosmic struggle and his personal allegiance to the process of progressive integration. Therefore the religious man must be disciplined and equipped in body and mind so that he will have more energy for achievement than any other of like constitution and opportunity who has not the resources of religion; he must have more calmness and mastery in the midst of peril, age and turmoil; better physical health because of the poise and regimen of his life; more sensitivity and deeper insight into the bonds of interdependence which hold men together into a great community which exceeds the reach of their mutual understanding and cooperation; a more passionate and richly integrating life purpose which can transmute and glorify the common things of daily experience; a capacity for joy which absorbs the goods and beauties of the world without making him selfish and unprogressive; a mystic method for achieving insight in the midst of the most complex and baffling problems of life. . . . If a man knows how to practice his religion as he should, it will provide him with this equipment of personality."

A Philosophy of Ideals. By Edgar Sheffield Brightman. New York, Henry Holt & Co., 1928. Pp. vi + 243.

Idealism, for the writer of this volume, is a philosophy of ideals. It comprises not merely the view that ideals are potent human instrumentalities but likewise the doctrine that they are a revelation of the cosmos, that they are embodied alike in experience and nature. This philosophy the author differentiates from its major rivals of today and defends, more specifically in the form of personalism, against various lines of attack. He conceives values to consist "in a society of persons, attaining common purposes, and realizing common ideals; such that these purposes and ideals find their significance in being the expression and fulfillment of persons and what they ought to be." *New Horizons of the Christian Faith.* By Frederick C. Grant. Milwaukee, Morehouse Publishing Co., 1928. Pp. xxix + 297. \$1.50.

In this volume, presenting the Hale Lectures for 1927-28, the newly elected President of the Western Theological Seminary, aims to further the elaboration of a comprehensive synthesis of thought, faith, and ethical and aesthetic experiences. "For in fact it is little less than a Christian philosophy that we require, a philosophy of life, of the world, of destiny, of the spiritual significance of the universe: a central position which shall dominate all our thinking and give order to the whole of experience, thought, and feeling." Erudition, earnestness and thoughtfulness characterize the undertaking, and its results should prove of value to serious students of religion and theology.

Kant's Inaugural Dissertation. Translated by John Handyside. Chicago, The Open Court Publishing Company, 1929. Pp. xii + 85. \$2.00.

These admirable translations of selected passages from the very first published treatise (1747) of Kant, *Thoughts on the True Estimation of Living Forces*, of his essay, *On the First Ground of the Distinction of Regions in Space*, and of his *Dissertation on the Form and Principles of the Sensible and Intelligible World*, together with the brief introductory note by the translator of the last two essays, the late Mr. John Handyside, and the preface by the translator of the selections and the editor of the volume, Professor Norman Kemp Smith, constitute an important contribution to philosophical literature in the English language.

The Misbehaviorists. By Harvey Wickham. New York, Lincoln MacVeagh (The Dial Press), 1928. 294. \$3.50.

The author makes a somewhat witty and satirical attack on many of the contemporary thinkers. In the opening chapter he discusses "the modern temper" and contends that the "old" is better than the "new." He then criticizes various modern thinkers such as Watson, McDougall, Freud, Wiggam, Dorsey and others, including Will Durant, whom he calls "the Misbehaviorists." He discusses chiefly the contradictions and other apparent weak points in the books of these men, but his selection of quotations for attack covers such a wide period of time that it is doubtful whether his attacks upon closer inspection are not rather weak. He includes Will Durant among the misbehaviorists for not giving the scholastics and particularly Thomas Aquinas sufficient treatment. It appears here that the author is a partisan of the scholastic tradition. In his final chapter he shows that the modern temper is in reality very ancient. "Certainly the temper of these gentlemen is no newer than is the temperament of Lucifer." Perhaps a number of the "modern thinkers" would not consider themselves in bad company.

The Meaning of Selfhood and Faith in Immortality. By Eugene William Lyman. Cambridge, Harvard University Press, 1928. Pp. 47. \$1.00.

This booklet, presenting The Ingersoll Lecture for 1928, approaches the problem of immortality not as an isolated issue to be settled by an abstract course of argument, but as a question vitally connected with general theories of mind and of reality, of the meaning of life and the nature of our universe. In opposition to the contemporary naturalisms which identify the human self with the physical organism (the author refers to J. B. Watson) or which teach the inseparability of the two (as do S. Alexander and R. W. Sellars), Prof. Lyman portrays the self as "a center of creative experience, as the decisive factor in social evolution, and as gaining truth and power through uniting itself with the substance of the universe." Such a self *may*, he argues, be perpetuated, and faith becomes justified in holding that it actually is an heir of immortality when it takes into consideration the grounds for a theistic metaphysics, namely, "the order and organization which appear throughout the universe, the extent to which the universe has proven to be a producer of progress, and the fulfillment of selfhood which comes through interpreting human individuality as an integral part of a cosmic process which is creative of harmony."

Philosophy of Value. An Essay in Constructive Criticism. By LEO RICHARD WARD. New York, The Macmillan Company, 1930. Pp. x + 263. \$2.25.

The problem of value has figured prominently in recent philosophical literature, but until the appearance of the present volume nothing of a comprehensive nature on this subject has been available in English from the Catholic and Thomistic standpoint. A critique of prevailing views and, more especially, an analysis of why we act at all and of the "common-sense datum of value" leads the author to the conclusion that value is the capacity of an existent to be an end of action. Value, he holds, is not really separable from the object but "is in the object and not in the relation, not in the action, the need or the agent." Expressed otherwise, the thesis is that "wherever there is action, there certainly is value; indeed, at such place, value is demonstrated. But unmistakably, there is static value in the mere existent from the beginning, because the existent is possible aim of action. Yet functional value needs something in addition to *ens* or existent and in addition to this as desirable; to *ens* as desirable, functional value adds the element of being desired. This makes a logical difference. Such a view of course puts value very nearly into the category of 'good' or *bonum*. For value, we say, is resident within the existent always, and is functionally there when this is object or is sought. And 'good' says Saint Thomas, 'is anything'—is the thing itself—in so far as it *can* be *striven* for and in so far as it is the end of conative action."

An extensive annotated bibliography adds to the usefulness of the volume.

The Alchemy of Light and Color. By Oliver L. Reiser. New York, W. W. Norton & Company, Inc., 1928. Pp. 78. \$1.00.

The New Science Series is again enriched by a thoughtful booklet. In this case we are told of the physical, chemical, biochemical, and neural bases of color, in terms of recent scientific discovery and conjecture. Summarizing his results, Prof. Reiser states that he has sought to exhibit the mutual implications of the following ideas: "(1) The oxidation and reduction of carbon compounds underlie the production of color in chemical substances; (2) the chemistry of life is the chemistry of carbon compounds; (3) the doctrine of chronaxy supplies a suitable substitute for the specific energies theory; (4) that by associating the frequency of neurone discharge with the attendant electro-magnetic fields of force (of which "bioluminescence" in vision is but a special case) we have provided a basis for the qualities of conscious experience the presence of which the behaviorist cannot explain by his system; (5) that consciousness of color therefore somehow reduplicates the physical conditions of color; (6) because secondary qualities inhere in physical reality." Mind is conceived as "the expression of the dynamic equilibrium of labile tensions in the energy-fields"; the soul is described as "the harmony of the body."

Matter, Life and Value. By C. E. M. Joad. London, Oxford University Press: Humphrey Milford, 1929. Pp. xviii+416.

In this comprehensive volume, the author elaborates views set forth in his smaller works and particularly in the essay "A Realist Philosophy of Life" which he contributed to *Contemporary British Philosophy* (Second Series). In a somewhat original manner and in commendably intelligible terms he brings together a realistic epistemology with a vitalistic metaphysics.

Following a critique of materialism and mechanism, the concept of life is set up as an independent principle. The conclusion reached, however, is not a monism but a pluralism argued on the basis of the nature of relations. Knowledge, it is urged, is by perception, which is the awareness of sense data, and by thought, which is the awareness of subsistent objects. The exposition of this particular thesis shows Mr. Joad at his best; in fact, it presents an exceptionally persuasive account of one particular type of a realistic theory of knowledge. Values in the realms both of ethics and of aesthetics are held to be objective in the sense of being independent of the fact that they are known. Similar to Platonic ideas, they are described as transcendental to the world of sense.

The Philosophy of Art. By C. J. DUCASSE. New York, Lincoln Mac Veagh, The Dial Press, 1929. Pp. xiv + 314. \$3.50.

According to its author, "the present volume is the first of a projected group, the aim of which will be to develop in the principal fields of philosophy a certain point of view," one that endeavors "to push relativistic analysis as far as it will go in all fields of philosophy." It is by use of this method that Professor Ducasse develops his theory of art. Its characteristic theses are said to be: "that art is the language of feelings; that the range of human feelings includes vastly more than the few emotional states for which we have names; that language is essentially objectification, and only secondarily communication; that art and beauty are things essentially distinct...; that Beautiful and Ugly are terms predicating of objects only the fact that some one who contemplates them aesthetically obtains from them feelings that are pleasant, or unpleasant; that judgments of beauty are therefore wholly relative to the constitution of the individual observer, and are 'valid' for others only as far as those others happen to be constituted like him; that art-critics are therefore never at all 'authorities' in matters of beauty and ugliness, but at best only guides, who may direct our attention to things which we then sometimes find beautiful and might otherwise have overlooked."

The Quest for Certainty: A Study of the Relations of Knowledge and Action.

By JOHN DEWEY. New York, Minton, Balch and Company, 1929.

Pp. 318. \$4.00.

In this, the most recent and, in many ways, the clearest, statement of his doctrine, Professor Dewey essays to show: (1) that philosophy's present failure directly to function in life is due to the historic separation of "thinking" from "doing"; (2) that this separation of thinking from doing springs from causes which antedate the rise of modern science and the present overwhelming interest in the "here" and the "now"; (3) that modern scientific method (wherein, incidentally, our most effective thinking is declared to take place) has completely abandoned the older notion of thinking as a "beholding of fixed and antecedent existences" in favor of a conception of thinking as a kind of "experimental operation," in which the "object of knowledge is prospective and eventual, being the result of inferential or reflective operations which redispense what was antecedently existent"; or, that "the true object of knowledge resides in the consequences of directed action"; and, finally (4) that, until this "Copernican revolution" becomes effective generally, philosophy must remain an inadvertence, an alien intruder upon the present scene, and can have no active part "in the drama of an onmoving world." The book concludes with a prophetic note in which its author indicates certain changes, both theoretical and practical, that could reasonably be expected to follow were philosophy to be conceived as method and divorced from all traffic with the "occult" and the "transcendental."

This volume contains no new doctrines. It does, however, give a touch of freshness and a new direction to old ones. For the first time Dewey here makes full use of the implications of scientific method in support of his instrumentalism. He even proposes to substitute Professor Bridgman's term "operational thinking" for that of "pragmatism." Furthermore there is noticeable a shift in the direction of realism. While this shift is as yet not explicitly avowed, and while the author's insistence upon the reconstructive and operational character of thought shows no decline in vigor, the ghost of realism more and more haunts the background of Dewey's instrumentalism.

Phenomenology as a Method and as a Philosophical Discipline. By Marvin Farber. Buffalo, University of Buffalo Studies, Vol. VI. Pp. viii + 130.

The author describes his purpose as twofold: first, "the presentation of phenomenology as a method and as a philosophical discipline, in the sense of Husserl, and with some regard to the history of concepts introduced;" secondly, the "systematic orientation and consideration of some of the really fundamental problems of philosophy, the last questions of knowledge." Prof. Farber has rendered a distinct service in directing the attention of English-speaking readers to an important philosophical movement which they have as yet too much neglected, and for aiding those who have wrestled with the obscurities of Husserl's own writings to a clearer understanding of this thinker's central ideas. The monograph leaves one with the impression that phenomenology is a fruitful field needful of further cultivation.

What Philosophy Is. By Harold A. Larrabee. New York. Macy-Masius, 1928. Pp. xii + 204. \$2.00.

Those who require an introduction in preparation for the facing of some one of the many introductions to, or first books in, philosophy, or who desire a book which he who runs may read, and that with some degree of interest, will find what they seek in Mr. Larrabee's elementary sketch of the spirit, motivations, quest, methods and divergent doctrines of philosophy. The book will not carry a reader far but during the journey it will insure him ease and enjoyment; it provides no stirring insights but perhaps it suggests that philosophy and philosophers have revelations in store for those who will gird their loins for the arduous ascent to the heights where these revelations become possible.

A Study in the Logic of Value. By MARY EVELYN CLARKE. University of London Press, Ltd., 1929. Pp. x+330.

Recent discussions of the theory of value have yielded a rich literature. The contribution before us deserves study partly for the rigorous way in which it deals with psychologistic tendencies, though mainly for its classification of the various theories of value and its spirited defense of the view that value is "a unique determination of objects, apprehended through judgment, but subsisting, like any other predicate, independently of the judging subject." The proposed classification of value theories is as follows: A. *Subjective theories*: (1) Affective. Value consists in feeling aroused by an object. (2) Volitional: Value consists in desire for an object. (3) Affective-volitional: Value consists in interest in an object. B. *Neutral theories*: (1) Value is a quality of objects as related to subjects, conditioned by judgment. (Dewey) (2) Value is a determination of the subject-object situation. (Alexander) C. *Objective theories*: (1) Value is an indefinable predicate, apprehended (a) by feeling—having a presentational function; (b) by judgment. (2) Value is a relation among objects. (3) Value is an "objective."

To subjective theories generally it is objected that "whether or not there is a sense in which we value without judging, at least we discover no *values* except through judgment; hence the subjective attitude assigned always presupposes a judgment—unless, indeed, it can be maintained that there is emotional as well as cognitive apprehension, and that value is a content emotionally presented"; but, "feeling, though a common accompaniment of the value judgment, is merely incidental to the valuing." Neutral theories "illustrate the difficulty of distinguishing the content from the activity of valuing so long as we retain the psychological point of view, from which value seems to be necessarily value *for a subject*. It is only when we raise the logical question: are the objects which we value really *valuable*, and by what standard can we evaluate them?—that we recognize that no analysis of subjective activities sheds any light upon the real problem at issue." The following passage well epitomizes the argument of the book as a whole: Value "cannot consist in the affective relation of subject to object, for the specific character that distinguishes so-called 'value feeling' from other affective states is simply its association with a judgment of value, whilst the same *petitio principii* is involved in the attempts to trace it to interest or desire, which are only related to it at all inasmuch as they commonly include this feeling, and so presuppose the judgment which it accompanies. The judgment itself cannot, however, be constitutive of the value, for value is not a particular that is brought into being through an act of judging or any other mental process. Though usually predicated of the actual, it may apply equally to the possible. Again, the theory that professes to avoid the disadvantages of both subjective and objective views by treating value as a subject-object determination is found to combine two inconsistent positions, one of which is open to the same objections as other relativist theories. Once it is perceived that its reality does not depend upon a subject, however, it becomes apparent that it must be apprehended, like other objective determinations, intellectually, for, even if "emotional presentation" be a genuine mode of experience, it can give us no criterion of validity; hence we require judgment to distinguish genuine from illusory values, i.e., to be certain that what is presented, or apprehended, is value at all. Lastly, the view that it is a relation between objects themselves is always found either to resolve it into something that is clearly *not* value, or to presuppose it in the objects related, whilst the theory that it is a unique type of objectivity seems to have little meaning, unless this be made to coincide with reality in the broadest sense, whilst even then it has too little connotation to describe a concept which, though admittedly *indefinable*, is by no means *indefinite* in its significance."

THE MONIST

THE DESCRIPTIVE THEORY OF SCIENCE¹

WE are all aware that in recent times new views have become current concerning the aim and the functions of Natural Science. We used to think that its aim was to explain. But for some time past superior persons have been assuring us that this was a complete mistake. The question which Science answers, they tell us, is not *why?* but *how?* Its aim is not at all to explain, but merely to describe.

Now if the issue here raised were, so to say, simply a domestic one, if it were just a private quarrel among the scientists themselves concerning the aims and the methods of their study, it would ill become a mere philosopher to take part in the dispute or even to offer any comments upon it. But unfortunately, although the Descriptive Theory began by concerning itself mainly with the details of scientific methodology, in these days it seems to have enlarged its scope, and has come to be a theory of the constitution of the external world itself. And whereas it began by being an obscure heresy it is now or soon will be the orthodox view: and with the whole prestige of Science to back it, will be thrust upon the layman in a thousand forms in every monthly magazine and every other evening newspaper. Thus philosophers, however ignorant of Science, have no longer the right to ignore this theory. For

¹ A paper read to the Moral Science Club, Cambridge, England.

it is entering, or has entered, upon the territory of Philosophy itself.

Yet although this theory is "very much in the air" at the present time, one has some difficulty in saying exactly what it is. Those who expound it in print seem to fall chiefly into two classes. Either they have been scientific writers like Mach and Karl Pearson, whose main interest is the study of scientific method, and whose philosophical views are stated mainly in 'asides' and intended perhaps rather to shock than to convince: or they have been popularisers (I do not use the word in an invidious sense) trying to make the latest discoveries of Science accessible to the layman, and although it is obvious enough that they have pretty definite philosophical views, those views are rather insinuated than expounded or argued for. The most important exception known to me is Signor Croce, who in his *Logica* (Part II chapters 5 and 6) seems to adopt the Descriptive Theory, though not under that name. But his account of it, though brilliantly written, is so brief and at the same time so metaphorical that I am not sure whether I have understood it at all. Nor can I quite make out how far another distinguished idealist writer, Mr. R. G. Collingwood, intends to adopt the theory. It seems to me that the conception of Science expounded by him in *Speculum Mentis* (ch. 5) is a kind of cross between the Descriptive Theory and the Pragmatist Theory. But in any case it is worth noticing that in his opinion the movement of which that view is the result is "by far the most important intellectual movement of the last half-century" (p. 181).

What is clear enough is that all these writers want us to change our opinions concerning the external world in some very radical way, but in exactly what way, remains

rather obscure. We can only gather certain hints. And in the first place, the Descriptive Theory, it seems, has abolished a number of things which most people believe in; its first triumph, we gather, was to do away with the notion of *Force*. But latterly, it seems, even *Causation* is unsafe: we hear it said that the word 'cause' has no place in Science, and consequently the old notion of a *Law of Nature* has somehow to be altered. And *Substance* of course has long ago been dropped.

Secondly, we gather that the Descriptive Theory, if it does not put Realism entirely out of court (meaning by Realism the doctrine that a world which can be called 'physical' in some not-too-Pickwickian sense exists independent of consciousness) at any rate makes Realism very much more improbable than it used to be, and makes some form of Idealism very much more probable. Thus, Mr. J. B. S. Haldane tells us in *Daedalus* that a Kantian period is upon us, and there are signs that Solipsism is becoming popular among distinguished physicists.

Thirdly, if Realism is much less probable, *a fortiori* the old-fashioned Materialism of the last century is less probable still. And it follows from this, we hear, that there is no longer any conflict between Science and Religion, or again between Science and the aesthetic consciousness. (*cf.* Mr. J. W. N. Sullivan's writings.)

Fourthly, many people seem to hold that the propositions of Science are neither true nor false, but only convenient or inconvenient—that is, that they are not propositions at all, but (I suppose) imperatives, like the recipes in a cookery book. It seems very doubtful whether this doctrine can be reconciled with the Descriptive Theory: yet the same people, I think, sometimes hold both. Obviously, it goes a long way with the Pragmatists: but as

Mr. Collingwood points out, it is not strictly speaking Pragmatism. It does not hold that 'true' *means the same as* 'convenient.' It is not committed to any particular theory as to the meaning of the term 'true,' and could quite well hold that this term is indefinable. Nor does it say that *no* propositions are either true or false (in which case it would of course be self-refuting): but only that the so-called propositions of Science (*e.g.*, those that profess to state Natural Laws) are neither true nor false, because they are not really propositions. The propositions of Philosophy, on the other hand, and according to Croce those of History also, really are propositions, and *are* therefore either true or false, according to the theory.

Lastly, the Theory of Relativity appears to have given a new impulse to the Descriptive view. Mr. Russell says somewhere that it has shaken the traditional doctrine of substance more than all the arguments of the philosophers. Some people indeed seem to think that the Descriptive view (with all the implications that I have cited) has been definitely established by the Theory of Relativity, or at least that nobody can consistently accept the one and reject the other. Other authorities deny these propositions: and it seems probable that they are right, for it would be very odd if a scientific hypothesis, however far-reaching, could establish or refute a philosophical theory concerning the external world and the nature of our consciousness of it—and that is what the Descriptive Theory really is. But however this may be, it is I believe true that many relativists are also descriptivists, and there seem to be grounds for thinking (I speak with diffidence as a layman) that the Theory of Relativity is more easily expounded in terms of the descriptivist philosophy than in terms of a more ordinary realistic philosophy, though it is compatible with

either. It is therefore psychologically natural, though not logically necessary, that the Descriptive Theory should have strengthened its hold both upon the scientific and the lay mind ever since the Relativity Theory came to be generally accepted.

These then, or something like them, are the views about Nature which the Descriptive Theory asks us to accept. In some ways they are attractive. The conflict between Science and Religion has troubled mankind for two centuries at least: and there have been lesser conflicts between Science and the moral consciousness and perhaps between Science and the aesthetic consciousness. Everybody would like to see these conflicts abolished. Mankind would then have some chance of becoming really civilised. But is not the price too great? Are we prepared to give up the categories of substance and cause, and to surrender the independent reality of the external world? Are we prepared to give up the hope of explaining the changes that we perceive and content ourselves with describing them? (If scientific investigators cannot explain them, it is pretty certain that nobody else can.) And perhaps the statement that Science is neither true nor false but only convenient is the most shocking of all.

If we are to make up our minds concerning these doctrines, we must obviously begin by asking whether they really do follow from the Descriptive Theory. Perhaps some of them do, and others do not. We must therefore enter upon a philosophical examination of the theory, and we must examine it (I repeat this in order that there may be no misunderstanding) not in so far as it is a theory of scientific method, for that is not our business; but in so far as it is a philosophy, *i.e.*, a theory of Nature and of our consciousness of Nature.

Clearly we must begin by asking two questions: 1. What is it that is described? 2. What does 'describing' here mean?

It is fairly obvious what answer the descriptivist would give to our first question. He would say that the entities which science describes are 'phenomena' or 'sensations' or possibly 'perceptions.' These words are notoriously ambiguous. But it is pretty clear that they here mean sense-data or percepts, not sensings or perceivings. No doubt some descriptivists have accepted Idealism simply because they failed to see this ambiguity. But, as we shall see later, they have better arguments for Idealism than this one, and their theory can perfectly well be stated in terms of sense-data or percepts. Indeed I think that most descriptivists would be quite content to say that the task of science is to describe *events*: and in this word there is no reference to the consciousness of sentient beings.

The second question "what does 'describing' mean?" is much more difficult. To describe an entity is presumably to recognize it to be an instance^{1a} of some universal or concept: and to express one's recognition in a proposition. The subject of the proposition will always be a singular term.² But I do not think it need be a *concrete* term: for instance it is a description of honesty to say that it is the best policy. It might be held that the predicate must always have the definite or indefinite article prefixed: thus *Trinity College is the largest college in Cambridge* would be called a description of Trinity College. But *Trinity College is large* would not. It is not clear to me that this view would be correct. It seems to me that to assign any

^{1a} This universal may cover the whole being of the entity, as when I say this is a cat: or it may cover only an element in its being, as when I say this is black, or this is on the floor. (The distinction is Cook Wilson's.)

² It might itself be a description: *e.g.*, The man on the left of the fireplace is the Professor of Latin.

characteristic to an entity is so far to describe it, though of course the description need not be either sufficient or complete.

The simplest and most fundamental descriptions are those in which the subject is a demonstrative pronoun: *e.g. this is a cow, that is the Professor of Latin*. But as these two examples show, not all descriptions, even of this fundamental kind, can be called scientific. No one would say that it is the business of Science to utter such statements as *This is a cow*. And if it be said that these things (the cow and the Professor) are not sense-data, nor events, we may change our example: would anyone say that *this is a noise* or *that is a lightning-flash* were the kind of statements which Science aims at making? Clearly not. When Science makes such statements, it does so merely as a means. It does not think that its aim has been achieved when it has made no matter how many of them. Yet they are certainly descriptions, and descriptions of sense-data, or of events, or (if the word is too dear to be abandoned) of 'phenomena.'

It is more plausible to say that the descriptions which Science seeks to give are *simple* or *general*: *i.e.*, that it seeks to describe not one event at a time, but whole groups of events at once. And this is what descriptivist writers usually say: some of them illustrate or perhaps obscure their meaning by comparing Science with shorthand. Thus Croce says "the natural sciences and the empirical concepts which compose them arise as a shorthand transcription of the living and changeable reality" (*Logica*, Part 2, Ch. 5, p. 224). And it may well be said that *All matter gravitates* or *Salt is soluble in water* really are 'simple' descriptions in the sense that each of them describes a multitude of events at once; and that if we could find a single statement that described at one blow all the events that there

have been, are or will be, the ultimate simplification would have been accomplished, and the final goal of Science reached. (I do not think it is necessary to distinguish 'simple' from 'general.' If descriptivists usually prefer the term 'simple' or sometimes 'brief,' this is probably due to the conceptualist bias which many of them are afflicted with—a bias which we may discount for the moment, since it does not seem essential to their theory.)

Still 'simple' by itself is clearly insufficient. The statement that 'Nature is what is known by the senses' is a description of Nature, and a very simple or very general one. But nobody would say that it was a *scientific* statement. It is obviously philosophical, not scientific. Science is not content with anything so *formal* as this. The description at which it aims must somehow comprehend within itself the specific detail of Nature: whereas the statement *Nature is what is known by the senses* might still have been true even if the observed detail of Nature had been quite different from what it in fact is. It is a description of all possible 'Natures': whereas Science wants to give a description of this particular Nature which now is, and in which we live and move. If we put in the word 'comprehensive' this point is made clear. For *comprehensive* and *formal* are obviously opposed. The proper expression of the theory therefore is: what Science aims at is a description of sense-data or of events which is as simple and comprehensive as possible.

But even so we are not out of the wood. Imagine that we could take a view of all the events which have happened, are happening, and will happen. Is it not obvious that there are *many different ways* in which they could be simply-and-comprehensively described? For instance, we might take an arbitrary event say that which is happening

in the middle of this page at 8 p. m., g. m. t., on May 24th 1929: and we might describe all events past, present and future by stating their spatio-temporal relations to this. This description would be comprehensive in that it would take account of specific differences between events, and would not confine itself merely to those formal (or so to say metaphysical) characteristics which they all have in common. And it would be susceptible of 'simplification.' For space-time could be parcelled out into regions, and all the events that occurred in region No. 1 could be grouped together and so could all the events that occurred in region No. 2, and so on: and these regions could then be grouped into larger regions. But such a description, if we could make it, would not be Science in the sense in which Physics or Biology are sciences. What we should have constructed genera. But this again, whatever it is, is not Science.

Or again we might describe all these events by reference to their sensible qualities. And the sensible qualities could be grouped under a small number of heads—colour, sound, thermal quality, etc.—each having its species and sub-species: this would enable us to simplify our description. But this classification of events in terms of their sensible qualities, though it would be a simple and comprehensive describing of them, obviously would not be Science.

Again we might, I suppose, use as our *fundamentum descriptionis* the emotions aroused by these events in actual or possible observers: some of the events would be disgusting, others alarming, others merely boring, and so on. And here also our description could be simplified by grouping these characteristics as species under a small number of genera. But this again, whatever it is, is not science.

From these examples it is plain that our statement of the Descriptive Theory is not yet satisfactory. It is not enough to say that the aim of Science is to describe events

as simply and comprehensively as possible. It is necessary to specify in terms of what kind of characteristics the describing is to be done, *i.e.*, to state what we called just now the *fundamentum descriptionis*.

At first sight it seems easy to do this. Why not say 'to give as simple and comprehensive a description as possible in terms of cause and effect'? But of course this will not do. For the Descriptive Theory eschews the notion of cause and effect: notoriously, it maintains that they are mere relics of primitive anthropomorphism and have no place in Science. And it professes to provide an alternative to the ordinary cause-and-effect theory of Science: indeed to provide one is perhaps its main business.

So we must restate the *fundamentum descriptionis* and say: the Descriptive Theory holds that the aim of Science is to describe events as simply and comprehensively as possible *in terms of regular sequence*. And with this, we may hope we have at least reached a satisfactory notion of the sort of describing that is meant. If we are right, the theory will have to distinguish three main stages in any scientific inquiry.

The *first* stage is that of judgments of perception. Here we take the observed events, and we recognize that each such event has certain characteristics, or is a certain type or kind of event, *e.g.*, This is an explosion, this is the fall of an apple, that is a lightning flash, this is the taking of Prussic acid by an Englishman, and so on. (The scientific advocates of the Descriptive Theory do not usually notice this stage, I think. Or if they do, they do not see what difficulties it raises. Their theories of perception are in general very naive. Usually they are either crude sensationalists or what I may call physiological solipsists.)

The *second* stage is as follows: (a) As a result of the first stage, we have now before us a vast multitude of events, each having a certain character or having certain qualities; (b) we now notice that the number of characters is a good deal smaller than the number of events, *i.e.*, that every event *resembles* many others in many respects—there are many explosions, and many Englishmen take Prussic acid; and thus we group events into *classes*; (c) we find that each class of events has members at several or many different dates and places; (d) we now seek for each kind or class of event a determinate kind or class of constant antecedents. (This is the step expounded by Mill in his chapters on the Inductive Methods.) This process of finding is guided by no insight into or intuitive awareness of “necessary connexions.” So far as we know, (according to the Descriptive Theory) there *are* no such connexions, in Nature at least. We simply examine a number of cases in which E occurs: we find that in each case A precedes it at the same determinate interval, whereas its other antecedents vary from case to case: and we find that when A is removed (all else remaining the same) E is removed also. We conclude that events of the E kind are constantly preceded by events of the A kind, at a certain determinate interval of time (whether zero or not).

The *third* stage: we have now portioned out the events with which we started into a number of types of *sequence* or *process*, in each of which an event of one kind constantly follows upon an event of some other determinate kind. In the third stage, we *classify* those types of sequence, as species, under a smaller number of generic types of sequence: *e.g.* fallings of apples to the earth, risings of the tide when the moon’s position changes, and movements of the planets round the earth, are all cases of gravitational attraction. (In this particular case the man-

ner of 'specification,' or specific differentiation of species within the genus, will be quantitative. Bodies of *such and such* a mass and at *such and such* a distance will attract each other to *such and such* a degree.) Or again the changes undergone by races of animals in captivity and by races of wild animals may both be brought under the genus 'selective process'—the one artificially selective and the other naturally. If possible, the generic types of sequence so found are to be classified again as species under a smaller number of higher genera.

And so we arrive, by these three stages, at a *simple and comprehensive classification of the constant sequences of observed events*. First come the judgments of perceptions. Then the finding of constant sequences of perceived events. Then the classifying of these sequences (as specific differentiations) under a small number of genera or general types of sequence.

Now if this is the Descriptive Theory of Science, there are certain obvious comments which we may make upon it.

1. It seems to be nothing new, but to be simply the old Uniformity Theory of Mill and others. Mill and other empiricists would say that the business of Science is to discover uniformities of sequence and concomitance in the events which we observe. It is true that they talk about 'explanation,' and explanation might seem to differ from description: we might think that to explain meant to answer the question 'why?' which the Descriptive Theory forbids us to do. But when Mill speaks of explanation he clearly does not mean this. His three types of explanation, —by resolution into parts, by intermediate links and by subsumption—are simply ways of answering the question 'how?' and the first two reduce in the end to subsumption, which appears not to differ from what the Descriptive Theory calls 'simplification.'

2. A more fundamental criticism is that the descriptivist forgets how extremely *fragmentary* our observations are.³ Most of the sequences in whose constancy we firmly believe have never been observed from beginning to end: in most cases, perhaps in all, we observe only a bit of each sequence and 'fill in' the rest. For example, bodies near the earth fall when their supports are removed. But we often observe them falling when we have not observed the removal of their supports: for instance a tile falls on our head, though we never saw it dislodged from the roof. Again we often observe removal of supports without observing the alleged constant consequence of this: for instance if I drop a pencil out of my window on a dark night, I do not see it falling. If we stick strictly to the events which we actually perceive, adding nothing, we shall find that we have evidence for very few constant sequences indeed, perhaps for none at all. Not only the limited range of our sensitive faculties, but interruptions in their working, *e.g.*, by blinking, fits of inattention or of attention to something else, periods of non-perceptual consciousness, *e.g.*, dreaming, and of purely conceptual thinking, and perhaps periods of complete unconsciousness, *e.g.*, in dreamless sleep—all these must be taken into account. Nor may we appeal to testimony, since this would land us in a vicious circle. For if we did, we should be presupposing the constancy of a sequence, the antecedent in which has not been and presumably cannot be observed: we shall be assuming that the occurrence of certain noises or the coming into being of certain black marks on paper constantly follow upon acts of knowing, believing, and the like.

Thus if we stick strictly to the perceived we find not a simply and comprehensively describable world, but a

³ This criticism applies equally to Mill.

chaos of undescribable fragments. This obvious fact is concealed from the descriptivists and from Mill because they tacitly suppose themselves to be describing the sense-data of a sort of *omnipercipient* observer, whose senses suffer from no limits and who can occupy all points of view at once. We all believe that if there were such an observer, the entities which he observed *would* be simply and comprehensively describable. But no one of us, not even Mach, is omnipercipient; and our notion of the experience which an omnipercipient observer would enjoy is formed by the most bare-faced extrapolation from the miserably fragmentary data which alone are perceived by each of us.

It follows that the proposition 'What we observe forms part of a simply and comprehensively describable order of Nature' is one which observation not only cannot prove, but cannot even support—just as on the ordinary non-descriptivist theory the Law of Universal Causation cannot be proved or even supported by observation. And this I think is rather a shock to the Descriptive Theory: a strict empiricist is not really entitled to hold it—yet many (though not all) of its advocates profess to be strict empiricists, and to have adopted the theory for that very reason.

We must also object to the doctrine of Croce that the business of the physical sciences is to *make an index to History* (i.e., I suppose, to the perceived). This I think is just a metaphorical way of putting the Descriptive Theory. The objection to it is: before you can make this index you must forget the greater part of your text. For observation or history only gives you the most meagre fragments, and if you stick to them alone, you will have nothing to make an index to.

3. What about *prediction*? How can we describe what has not happened yet? It is very odd that advocates of the

Descriptive Theory stress the practical utility of Science so much. For its practical utility disappears entirely if you cannot describe what has not happened yet. And what an extraordinary kind of description that is! What we may call post-diction—*i.e.*, discovering what must have happened in the unobserved past, as geology for instance does, or indeed discovering what must have happened before I was born or before I came into the room—raises just the same difficulty. (We may add, for the benefit of the Croceans, that all historical research which uses documents or inscriptions raises it too.) Or in terms of Croce's own metaphor, by what right do we make an index to those parts of the book which we haven't read yet, and to those which we cannot possibly read?

It seems to me that both these objections (Nos. 2 and 3) can be met only in one way—by the use of what Kant calls a Transcendental Argument.

No. 2 might be met as follows: If what I observe cannot be thought of as part of a simply and comprehensibly describable order of Nature, my unity and identity as a self-conscious thinking being cannot be preserved. Therefore whatever *I* observe, so long as I remain myself, must be capable of being so thought of. Thus in terms of Croce's metaphor I am entitled to forge the greater part of my text, adding enormously to the few fragments which alone are given to observation. For the knowledge "that the text is indexable" is in a manner prior to the reading of the text itself. And what seems like wanton 'cookery' is really a necessary precondition of self-conscious experiencing.

No. 3 is met similarly. If what I observe now and what I shall observe in the future cannot be thought of as parts of *the same* simply describable order of Nature, I shall not be the same self-conscious thinking being in the future as I am now. Therefore whatever *I* observe, so

long as I remain myself, must not only be *describable*, but *describable in the same manner* as what I observe now. (Analogously for post-diction.)

If these two transcendental arguments were admitted, the Descriptive Theory (thus supplemented) would I think be perfectly tenable. But we should have to say that although the business of the scientific investigator *in his scientific capacity* was just to describe events as simply and comprehensively as possible: yet in his capacity of *intelligent being or self-conscious subject* he would do far more than describe; by the process which Kant not very happily calls synthesis, he would pass beyond the meagre and chaotic data of sense, and would construct or rather constructively discover the very entities which as scientist he subsequently describes.

If on the other hand all transcendental arguments are rejected, this rejection clearly affects *all* theories of Science, not merely the Descriptive Theory. For they all have to assume the truth of some axiom or axioms which do not seem self-evident; and if those axioms cannot be proved by transcendental argument, there seems no way of proving them at all. The descriptivist is only at a disadvantage in this, that he usually professes that his theory is empirical in a sense in which other theories are not—a claim which, as we have seen, cannot be admitted for a moment.

So much by way of exposition of the Descriptive Theory. We must now try to say something about its wider philosophical implications. And first, it is thought in some quarters that the theory has succeeded in exploding the notions of substance and of causation. I cannot see the slightest ground for this. The most it could claim to have shewn is that *Science* has no need of these notions. But scientific cognition is not the only mode of cognition: and what Science studies is not the whole of the real. And

indeed it may be said, this is just the point which the Descriptive Theory (as contrasted with previous theories) has made perfectly clear. It might be the case that in our ordinary perception of the external world (though not in our scientific describing of it) we constantly apply those categories, or apprehend those categorical factors; as indeed we obviously do. Further, if we did not, the Descriptive Theory would have nothing to describe. What it describes are *events*: and whatever account we may give of substance, and under whatever other names we may introduce it,⁴ it seems to me perfectly clear that there can be no events without substances to or in which they happen. And not only cannot events be without substances; it is even more clear that they cannot be *apprehended* as events except we also apprehend the substances to or in which they happen. Moreover, in order to be conscious of the persistent identity of a substance which endures through time, we must I think apprehend relations of *immanent causality* subsisting between the events which make up its history. (Whether a substance can *have* identity in the absence of such immanent causality I do not know.) And it seems impossible to draw any line between immanent causality and *transeunt causality*, since a single substance may consist of substances, and the transeunt action of these substances upon one another may be essential to the very existence and therefore to the persistence through time of the whole which they together make up. (Any machine or any organism will do as an illustration.)

We may also bring certain arguments *ad homines* against those descriptivists who think they have removed substance and causality not only from Science, but from Reality itself. In the first place they themselves must allow that there are what we may call *descriptive correlations*

⁴ For instance under the name "*long event*."

between events. And these correlations will be in at least two 'dimensions'—simultaneous and successive. A set of simultaneous and successive events united into one describable whole by such correlations looks uncommonly like what most people would call a substance—especially when we remember, as we must, that the *correlata*, the 'events' of which the describable whole is formed, are really only abstractions from a continuous process. And the descriptive correlation which binds them into one whole looks uncommonly like immanent causality. A similar argument could be brought with regard to transeunt causality.

But to this the descriptivist may answer that the only sort of substance he is abolishing is the old-fashioned *substratum*—the something we know not what which stands over against or behind qualities, relations and events, and is entirely inaccessible to observation. And he may add that the only sort of causality he is abolishing is the *active* or anthropomorphic sort. Now I shall waste no tears on the 'something we know not what' of Locke. It seems to me that the identity of a substance through the diversity of its qualities and relations, and its identical persistence through time, can be otherwise provided for—though even then, it is by no means clear to me that change (to say nothing of individuation) can be adequately expounded without the use of some conception analogous to the *matter* of the Schoolmen, Aristotle's *ὕλη*; and I think I can see this turning up in modern philosophy under other and to my mind less suitable names, *e.g.*, under the name of Space-Time.

But if we let go the Lockean substance, we cannot so easily surrender activity. And here we may use an *ad hominem* argument, somewhat similar to a celebrated argument of Mr. W. E. Johnson against the Naturalists.⁵

⁵ *Logic*, Vol. III.

Descriptivists warn us that our ordinary notions of causality are anthropomorphic. According to them, we ordinarily believe that the earth pulls at the moon with an effort, as we tug at a recalcitrant kite. And that belief they consider to be a mistake. The earth, they assure us, does not really make efforts, and it enjoys no organic sensations. And they seem to regard it as their chief business in life to repeat these solemn platitudes *ad nauseam*. But when these same authors come as they sometimes do to dabble in Psychology, we find that they try to abolish activity in men also, just as they abolished it in the external world. They reduce the human mind with Hume to a series of sensations and images, and we discover to our astonishment that there is no 'we,' and that if there were, we could not conceivably *do* anything.

But if this is so, what becomes of the charge of anthropomorphism? If we do not ourselves experience activity, how can we possibly make the mistake of 'projecting' it into external objects? Not only would the mistake not occur, it would not even be conceivable. I cannot mistakenly identify A with B unless I have got the conception of B. And how am I to get it, except by apprehending instances of it? A similar reply may be made to the charge of *animism* which is sometimes brought against those who accept the category of substance. How can I 'project' the unity of my own ego into the external world if I am not conscious of the unity of my own ego, and how can I be that, if my ego is not a unity at all, but a mere series of sensations and images?

But to leave *ad hominem* arguments, is it not obvious that we are in some sense conscious of our own activity, *i.e.*, of *doing* things? I should have thought that there was nothing more certain than this. Thus in our own case, if in no other, the activity view of causation seems to apply.

But if this is so, I venture to suggest that we can go further. We cannot act without *acting upon* something. And in acting upon a thing, *e.g.*, in bending a stick, are we not *eo ipso* conscious if not of counter-action on the thing's part, at any rate of something very like it? I do not see how to argue the matter. The consciousness of activity in ourselves, and of this quasi-action in the things which we act upon, is either an absolutely fundamental datum, which Philosophy must just accept as an ultimate, or it is a mere delusion. I can only appeal to every man's reflection: and let him reflect (if I may say so) not when he is in the study, or even when he is playing backgammon with his friends, but when he is swimming, or climbing a mountain, or digging a hole in the garden.

This quasi-action of external objects differs from our own action in being non-teleological in many cases.⁶ It is rather *obsistence* than *action*. But whatever it is, that it is something, and that it is more like activity than mere sequence (however simply describable) seems to me so certain and obvious that arguments against it must be wrong somewhere. And if things exercise this quasi-action upon us, we may fairly believe that they exercise it on one another; and if so, the uniformity theory of causation will not stand as a complete account.

There is one more question which is so important that we must say something about it. In what sense, if any, is the descriptivist committed to an *idealistic* theory of knowledge?

As we noticed earlier it seems to be thought that once we adopt this view of Science and of natural laws ('laws are only descriptions of how things happen'), such philosophical doctrines as Materialism, and indeed all forms of 'Naturalistic' doctrine, are very much weakened. The

⁶ When it does display teleology, we say that the object is either itself alive, or produced by what is alive.

question is, why is this thought to be so? It is true that the strength of Naturalism, as of sin, is the law. But then the laws of nature are not in any way abolished by the Descriptive Theory: it is true that their 'necessary' character (if they were ever alleged to have it) is done away with, in a sense. It is not necessary that every A should be followed by a B, and every B preceded by an A: it just happens to be so. But if the Kantian arguments above expounded are valid, it *is* necessary that every B should be preceded by *some* one and the same determinate kind of event. It is true that the word law is avoided by the Descriptive Theory, perhaps wisely: yet its old meaning, or something very like it, is retained. And Science can still make just the same predictions on the Descriptive Theory as it could on the old theory. How then is Naturalism weakened?

Is it that the word 'description' lays more stress on the activity of the mind than the word 'law' did? A description is something that the thinker makes or creates; but a law is something that just is, whether anyone thinks of it or not. Thus we arrive at a subjectivist or idealist view of Science: matter, for instance, (we are told) is not anything real—it is just *our way of describing sensations*—and the material world is just the totality of scientifically-described sensations, actual and possible.

But why accept this view? It will only recommend itself to Nominalists, and Nominalism is false, since it cannot even state itself without giving up Nominalism—still less can it *argue* in favour of itself. But if we reject Nominalism, and hold that to describe something is not merely to utter noises, but to express in words the characters which entities are apprehended by us to possess—then the Descriptive Theory gives no support whatever to subjectivist theories of knowledge. Science will be the

description of uniformities really existing in the world, or of relations of non-separation really subsisting between events; and those uniformities will really be the specific differentiations of those generic types of uniformity under which Science classifies them. Both description and classification then are modes of apprehending what really is, or of expressing such apprehension in language. Whether the previous (and non-scientific) acts of categorial synthesis by which we 'refer' our fragmentary sense-data to an ordered system of Nature be a support to Idealism we need not discuss.⁷ For *any* theory of Science, and not the Descriptive Theory only, must presuppose those syntheses.

But it will be said, what about the *Denkökonomie* of Mach (whom Croce follows)? The descriptions that Science gives are not mere *flatus vocis*: but neither, we shall be told, are they apprehensions of real relations of constant sequence and of species to genera: they are devices to save us trouble. But we must ask, what kind of trouble do they save? Is it the trouble of *thinking* that they save (as Mach expressly says in one place, and as the term *Denkökonomie* strongly suggests), *i.e.*, I suppose the trouble of thinking of each event after another, one by one? But wouldn't it be less trouble not to think at all? And if you are going to think, the only labour-saving device that is any good is one that will help you to apprehend that which really is; the only genuine thought-economy is the apprehension of *real* universals and *real* relations. To pretend they are there when they are not will not help you to know the real, and is therefore no economy at all. Or is it that the descriptions given by Science save us trouble in *acting*? Certainly they do. But they would not save any trouble at all unless they were *cum fundamento in re*. Mere fictions and fairy tales do not assist us to act more

⁷ For my own part, I do not think that it is.

successfully. But apprehension of the real does, because it is the real that we have to act in and upon. And if it be said "surely Science uses fictions (*e.g.*, the idea of a perfect gas) and 'mechanical models' (*e.g.*, of the atom as a sort of solar system) and mathematical devices of which no rational account can be given"—if this is said, we answer by asking 1. Why does Science do this? 2. Is it *describing* when it does this, and if not, what is the good of mentioning these questionable procedures? Of course the truth is that these are not *part* of the description itself, but *means* to it. And the veracity of the description is not affected by this, any more than it is by the fact that the scientific man's microscope was paid for by a fictitious cheque.

There seems to be only one way left in which the descriptive theory of science could be held to have weakened naturalistic doctrines. We have referred to the point before in another connection. If we hold that the business of Science is just to describe the course of Nature, we shall be led to reflect that the same entity can often be described in many different ways, all equally correct and legitimate. What can be described in one way upon one *fundamentum descriptionis*, *e.g.*, by the classification of regular sequences, can equally properly be described upon another, *e.g.*, in an aesthetic or historical or geographical way. Now perhaps naturalistic philosophers have thought and still think that Science is *the* one and only way of apprehending Nature. And certainly the habit of speaking of scientific propositions as *the* laws of Nature may have encouraged them in this opinion. Or to put the same point rather differently, perhaps they have not always realised that the proposition "Science is the discovery of the laws of Nature" is in one sense just a tautology, since *Nature* in one sense just means that whose laws Science discovers. If we adopt this language we must say that the naturalists

believe that Nature is the whole of the Real, and that this is a mere prejudice since (1) that which is Nature may also be something else (*e.g.*, it may be a beautiful spectacle, or an object of religious awe); (2) there may be and there are other realities besides this one which is Nature (*e.g.*, minds). And it might be held that the Descriptive Theory of Science helped to dispel this prejudice.

If this were all, the Descriptive Theory would perform a certain service to anti-naturalistic philosophers, but not a very important or a very new one. But it seems plain that those who advocate the theory consider that its services in these other respects are very important indeed. And it is very desirable that they should (if the phrase may now be allowed) explain why they think so.

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MATHEMATICS AND EMERGENT EVOLUTION

I. *Causal Laws and Differential Equations*

EVER since the time of David Hume the problem of causality has been a source of worry to philosophers. Attempts to reestablish certainty in the inductive sciences through a refutation of Hume's reasoning have not met with general acceptance. We may therefore conclude that the question of necessary connection of natural processes is still an open one.

One of the most promising of the suggested solutions lies in the attempt to assimilate the notion of causality to the mathematical concept of functional relationship. According to some theorists, the cause-effect relation may best be regarded as but another name for the mathematical relation of dependent variability. Thus, to illustrate, if we have a ladder leaning against a wall, the cause of the descent of the top of the ladder to the base of the wall, which common sense ascribes to the fact that someone pulls the bottom of the ladder away from the base, may be interpreted mathematically as a case in which a variation of the independent variable, x , (distance from the origin along the abscissa of the Cartesian coördinates) is correlated with a corresponding variation of the other (dependent) variable, y , (or distance along the ordinate). Here there is a causal connection because $y=f(x)$.

This mathematical interpretation of causality has not

received the attention it deserves. A consideration of its utility in modern science may therefore help emphasize its value. Moreover, giving this viewpoint a more specific setting in the context of modern science has the additional value that it serves to illustrate the way in which science is so inextricably bound up with mathematics that progress in one calls for and creates progress in the other. As an illustration of the evolution of this notion of cause as a phase of the development of mathematical technique we will examine the way in which modern physical science has utilized the notions of the infinitesimal calculus.

Physics aims at predictability. Prediction in physics occurs when we judge the future of a system from our knowledge of its past. But in order that a system can get from where it is to some other (future) state, it must pass through the intervening points (distance) in space and time. In order to be able to predict, physics finds it desirable to employ a mathematical technique which will enable it to state the direction of change at each moment of the process. This technique was discovered by Newton and Leibniz at about the same time, and, as research seems to show, independently. In this type of mathematics, where differential and integral equations are used, such fundamental problems of dynamics as that of finding the velocity of a particle at a given instant are handled. Since the problem of finding the "tangent" at the point of a curve and of finding the velocity of a particle describing this curve when it gets to that point are the same kind of problem, the methods of calculus will yield an answer.

The doctrine that the processes of nature are predictable is called determinism. The deterministic theory states that the future history of the universe (either as a whole or in part) can be read from a *complete* description of its present state, including here a knowledge of the laws of

change which are appropriate to the system. Such predictability means, of course, that nothing new or unforeseen shall enter to upset the calculations. In a deterministic world all causes are *additive*; all effects are *resultant* effects. But in a world of emergent evolution such a *priori* predictability is impossible.

Now it is precisely in infinitesimal calculus that we reduce to a minimum the temporal interval between cause and effect, thus decreasing the possibility of qualitative novelties. By putting the laws of sequence or behavior in the form of differential equations, in the above fashion, the scientist provides himself with a guarantee that the axiom "there is no more in the effect than there was in the cause" will be observed. This view finds support in the statement of P. W. Bridgman¹ when he tells us that those properties of a system which can be described in terms of linear differential equations have the property of additivity: the effects of a number of elements is the sum of the effects separately, and no new properties appear in the aggregate which were not present in the individual elements.

This reduction of the principle of causality to the mathematical concept of functional dependence has another implication in addition to that of expressing determinism and predictability. It further undermines the animistic notion of causality as the expression of purposive agencies.

¹ *The Logic of Modern Physics*, p. 221.

In his book Prof. Bridgman has previously pointed out (pp. 111-113) that in his opinion the existence of conservative functions is involved in the possibility of describing natural phenomena with differential equations. In the integral of a differential equation certain constants appear which are determined by the initial conditions, and are therefore the same during the future motion of the system. Obviously (as he says), these constants correspond to conservative properties. And in other systems, in which we may not have differential equations, we may look for something analogous to potential energy which shall measure the displacement of the system from its initial configuration. Here again conservation may be guaranteed, so that the law of the conservation of energy is preserved; for, as Poincaré has pointed out, if we have a system in which conservation apparently fails, we merely invent a new form of potential energy to save the principle of conservation.

In the teleological notion of causality the cause must precede the effect because the end or purpose precedes the process whereby that purpose or goal is realized. But in the newer view, to the extent that the time element in science can be made reversible in the equations of physics to that extent the common sense notion that the cause must precede the effect is abandoned. This is exactly what happens in relativity physics, which appears to carry still further what we might call the "deanthropomorphization" of the causality concept. In relativity physics we have the three coördinates of Cartesian geometry tied up with the time dimension in one equation. Here time is turned into space merely by giving it a minus sign. From this point of view "past" and "future" may be treated as mathematically equivalent, and causality becomes a symmetrical relation. It is this which presumably justifies the statement of Prof. G. N. Lewis,² according to whom relativity geometry "removes the last foothold in the physical sciences of the concept of temporal causality."

Not all investigators, however, are prepared to agree to this. H. Weyl,³ for example, holds to the notion of causality as bound up with the unidirectional character of time from Past $\rightarrow$ Future. On the other hand, A. S. Eddington⁴ appears to agree with the interpretation. He tells us that while cause and effect are clearly bound up with time's arrow, so that the cause must precede the effect, the relativity of time has obliterated this order. As he points out (p. 102), in physics the temporal relation is arrowless and there is, therefore (p. 66), no more distinction between past and future than there is between right and left. The only exception to this rule is the second law of thermodynamics.

² *The Anatomy of Science*, p. 134.

³ *Space-Time-Matter*, Eng. trans., p. 310.

⁴ *The Nature of the Physical World*, p. 295.

II. *Emergence, Probability and Chance*

There are a number of philosophers and scientists who have objected to the view that nature is predictable on the basis of a knowledge of physical laws; these thinkers do not believe in the mechanistic doctrine that the entire course of nature is predetermined by physical laws. The mechanistic view has been opposed on various grounds. In philosophy Bergson has voiced his objections in the thesis that nature is creative, so that new things appear, especially in the realm of biological evolution. In science a recent reason for objection to the mechanistic view has been found in the new physics, especially in the new quantum theory. Since in this field fact and opinion are still fluid, any appearance of finality or dogmatism of statement is to be avoided. But it is at least clear that our ideas must be reorganized in the light of newly discovered facts, so that an inquiry into the nature and meaning of such terms as cause, time, emergence, chance, etc., is very timely. The following suggestions represent but a first approach to such a consideration.

Considering first of all Bergson's attitude, we find that he objects to a mechanistic (deterministic) view for the following reason. According to Bergson, a mechanical universe is one in which time does not count. In a mechanical world time plays the rôle of an independent variable. A strictly mechanical universe would be one in which the processes could be reversed. All that can happen in a mechanistic universe is the redistribution of mass particles in space. In other words, time is spatialized. This follows inevitably, it is said, from the treatment which time receives in the equations of motion of a system. But, Bergson says, in such a view, where time does not count, the creative aspect of evolution is being ignored. Real time must not be regarded as a "phantom" of space;

true time, or duration, is the movement wherein the past "gnaws" into the future.

Considering this conception, we may note that it is true that the spatial coördinates of a system are ordinarily treated as the dependent variables, while time is considered as the independent variable. This is the case, for example, in differential equations where the second derivative is acceleration. But in general the situation is not quite so simple. There are many equations in physics in which time functions as the dependent variable. Hence even physical time has no single and unambiguous meaning, and therefore to say that time must necessarily function as an independent variable is inaccurate. In so far, then, as Bergson's views rest on this misconception, his sharp contrast between the world of matter (the inorganic) and the vital world of creative evolution is to be looked upon with suspicion.

As already intimated, those who are sympathetic with the view that the processes of nature are creative have in recent years found added reason for doubting the validity of the mechanistic interpretation. According to some investigators, one possible implication of the new physics is that it lends support to the concept of emergent evolution. Let us see how this conclusion is arrived at.

In recent years, with the advent of new theories concerned with phenomena in the realm of micro-physics, it has become increasingly difficult to apply the laws of classical dynamics (of a deterministic system). The reason for this is as follows. According to the classical theory of mechanics, if the initial conditions of a particle (or system of particles) are determined one can, by applying the appropriate laws, predict what the later position of the particle (or system) will be. But research in the domain of intra-atomic phenomena indicates that if you

specify the velocity of an electron you cannot specify its position, and if you state the position of the electron you cannot state its velocity. But for prediction both are necessary. Predictability is made more difficult by the fact that if you observe a phenomenon (e.g. a moving electron) that phenomenon is no longer what it was, for the light ray which was implicated in this reaction between the observer and the observed has been responsible for a change in the phenomenon observed. Thus the conditions demanded by classical mechanics for prediction cannot be met. Hence, it is concluded, rigid causality and determinism are impossible in physical science. The most that can be done is to predict the limits within which the electron will probably be found. At best we get statistical certainty. Some investigators have been inclined to regard this intrusion of unpredictability and chance into physics as indicative of a genuine element of indeterminism in nature. Eddington, for instance, suggests that this fact that you get merely statistical certainty and determinism in some physical processes is a step in the direction of freeing human action from the sweep of mechanistic interpretation.

This is of course a possible point of view. But there is another interpretation of the situation. According to some thinkers the use of statistics, due to the inability to study and predict individual phenomena, is not proof of indeterminism. It is witness only to our ignorance of the causal laws involved. According to this view, everything in nature is equally "necessary" (i.e. causally determined or functionally related to antecedent and concomitant events), so that "probability" and "chance" are only names for our degrees of ignorance. In this view it is supposed that we are unable to make certain predictions because we are ignorant of the causal laws involved or because the

factors operating are too numerous or too intricate for isolation and quantitative statement. In terms of the mathematical notion of causation "chance" and "novelty" arise because of our inability to specify enough coördinates to determine the course of a process.⁵

It is possible that we will always be ignorant to some extent, in the sense that our knowledge will always be fragmentary and incomplete. To say that if we knew all the facts or all the causes we could predict the properties and behavior of anything in nature is a redundancy, for here "knowing all" is synonymous with the ability to predict completely, and in cases where such prediction is impossible we can always say that this is so because we don't know everything. It is even doubtful whether in such cases the word "all" has a valid meaning, for to know all one would have to be familiar with the entire past history of the universe (if it has a "history") and this is obviously impossible.

In terms of mathematics this means—if Prof. Bridgman is right—that whenever non-additive (or emergent) effects appear we must abandon the view that nature can be completely described in terms of differential equations of the type indicated. In transitions from one "level" to another a different type of mathematics must be employed, probably that of finite difference equations. However, when we have reached the "new" level, where uniformity again reigns, it is again possible to employ calculus. Thus differential equations are employed in expressing the laws of psychophysics, but this does not mean necessarily that because the psychologist uses the same mathematics which the physicist does therefore psychological laws are reducible to the laws of physical reality. This interpretation

⁵ In connection with this problem the reader should consult W. F. G. Swann's paper on "Physics and Vital Processes," in *Science*, 1928, Vol. LXVIII, pp. 413-419, and P. W. Bridgman's exposition of the "New Vision of Science," in *Harpers* for March, 1929.

appears to be in harmony with that of C. D. Broad, as summed up in the following statement: "On the emergent theory we have to reconcile ourselves to much less unity in the external world and much less intimate connection between the various sciences. At best the external world and the various sciences that deal with it will form a hierarchy. We might if we liked keep the view that there is one kind of stuff. But we should have to recognize aggregates of various orders. And there would be two fundamentally different types of law, which might be called 'intra-ordinal' and 'trans-ordinal' respectively. A trans-ordinal law would be one which connects the properties of aggregates of adjacent orders. A and B would be adjacent and in ascending order, if every aggregate of order B is composed of aggregates of order A, and if it has certain properties which no aggregate of order A possesses and which cannot be deduced from the A properties and the B-complex by any law of composition which has manifested itself in lower levels. An intra-ordinal law would be one which connects the properties of aggregates of the same order." Broad's distinction between the two types of laws would reappear in our doctrine in a distinction between the two types of mathematics employed, a mathematics of continuous quantities and a mathematics of discontinuous quantities.

If we thus interpret "emergence" and "chance" as names for our ignorance the doctrine of emergent evolution ought to prove acceptable to everyone. But such an interpretation hardly justifies the theistic interpretation which Lloyd Morgan, or the vitalistic view which Bergson, has arrived at as a result of surveying the facts of the "creative advance of nature."

⁶ *The Mind and its Place in Nature*, p. 77.

III. *Matter, Energy-Fields and Emergence*

And now we come to the positive philosophical implications of the foregoing doctrine. So far as these are concerned, the writer sees no reason to modify the view previously set forth,⁷ that there is a duality of natural law which allows us to set down certain contrasts between what are termed *dynamical laws* and *statistical laws*. It is interesting to note that Eddington favors such a dualism, which he expresses by the distinction between what he calls primary laws and secondary laws.^{7a} The contrasts he enumerates parallel in several respects the contrasts which the present writer has noted. According to Eddington, a primary law holds for the behavior of individuals and is indifferent to time direction; whereas a secondary law holds for aggregates rather than individuals, expresses probable rather than necessary results, and therefore introduces "chance" into our picture of nature. The second law of thermodynamics, illustrating a secondary law, gives to time the arrow which indicates direction and irreversibility.

In the present view statistical laws are interpreted in a phenomenological sense. By "phenomenology" is here meant a study of that which displays or exhibits itself; it is the "descriptive" point of view in science. A phenomenological (or phenomenalist) presentation is a pattern given in perception. Those who have followed the development of *Gestalt* theory have seen this view intrude itself into psychology. Another illustration of this attitude presents itself in the second law of thermodynamics. In botany we also find an example. Like the biochemist, who studies the intimate and complex mechanisms, we may analyze the petals of flowers into their intricate molecular

⁷ Cf. my article, "Probability, Natural Law, and Emergence," in the *Journal of Philosophy*, 1926, Vol. 23, pp. 421-435, and "A Spiritual Behaviorism," in *The Monist*, 1927, Vol. 37, pp. 289-308.

^{7a} Cf. *of cit.*, p. 75.

structures. But we may also view the flower as a phenomenal pattern. We must never forget that the flower, in spite of its detailed complexity, possesses a phenomenal simplicity which is responsible for its beauty to us.

According to the present view, it is the second law of thermodynamics which underlies the production of what are termed macroscopic (or phenomenological) patterns. This interpretation is not explicitly stated in Eddington's exposition. And yet what we have here set forth is quite consistent with his view. Eddington tells us (pp. xiv-xv) that the external world has become a shadow world, and that the drama of familiar life, from the point of view of present day physics, is a shadowgraph performance. And now we ask, why should we not identify this "shadow world" with the phenomenological world which expresses itself? And why should not the second law of thermodynamics be taken as providing the physical basis for these macroscopic patterns? Eddington almost comes upon this view when he later tells us (p. 105) that entropy is to be placed alongside beauty and melody, because it meets the essential requirement that all three appear as features of *arrangement*. Thus nature produces new (or second order) simplicities out of complexities of parts.

The writer has been arguing for years that the fields of force which are associated with material aggregates are implicated in the *averaging* process whereby macroscopic states are produced. This view, which allows us to state that *energy is the soul of matter*, appears to be in harmony with the latest surmises, among the more interesting of which we have the views of Sir J. J. Thomson as stated in his book, *Beyond the Electron*.

Basing his views in part on the results of his own son, G. P. Thomson, Prof. Thomson points out that a moving electron is a much more complicated thing than a small

point charge of electricity in motion. A moving electron is always accompanied by a series of waves, and these waves have complete control over its path; the electron is compelled to follow the lead of the waves. In other words, *the electron provides its own ether in the form of waves*. If we generalize this notion we arrive at the view that all material aggregates carry with them some sort of energy-field, which for psychology may have the significance that it provides a physical basis for what W. Köhler has pointed out: that parts of the brain which are structurally disparate may be functionally unified into a whole or *Gestalt*.⁸ This view that energy-fields in the ether, or wave patterns which *are* the ether, constitute the non-material substratum which is the "soul" of "matter" is consistent with the doctrine of the author⁹ that radiation plays some fundamental rôle in the fabrication of consciousness in the body.

IV. *The Bankruptcy of Materialism*

Various thinkers have noted the way in which problems may be created by the way in which we formulate our definitions. In connection with the mind-body problem this is illustrated by the fact that in classical physics matter was defined as the seat of *primary* qualities; hence, by definition, body could not be identified (or even correlated) with a conscious experience, such as color, which was therefore defined as a *secondary* quality in the mind. Thus the dualism of mind and matter has been created through *definition by postulation* and is not a result of *definition by inspection* (or induction), which is the proper type of

⁸ By developing the notion of the relativity of fields of force the writer has tried to unify physical and psychological relativity (of *Gestalt* theory). This attempted synthesis appears in the *Psychological Review* for May, 1930.

⁹ "Light, Wave-Mechanics, and Consciousness," *Journal of Philosophy*, 1928, Vol. 25, pp. 309-318.

It is interesting to note that a similar view has been advocated by L. L. Whyte in his booklet, *Archimedes or the Future of Physics*.

definition for a natural science to employ. Our thesis, therefore, is that the new physics now provides us with a theory of matter in which the gap between consciousness and matter is lessened. Hence the feasibility of identifying consciousness with its bodily conditions.

According to the present view, the dualism of consciousness and body is simply the (relative) dualism of matter and energy-fields. If therefore we soften the line of demarcation between matter and empty space we bridge the gap between soul and body. In order to see how traditional physics did indeed exaggerate the distinction between matter and the field of energy we need go back no further than the distinction between matter and space as embodied in Maxwell's equations. These famous equations, written in terms of calculus and therefore emphasizing continuity, were devised to express the way in which electromagnetic waves are propagated through the ether, or space free from matter. According to this view, matter might appropriately be defined as the region in which Maxwell's equations do not hold. A particle might even be defined as a hole in the ether. In either case the universally postulated sharp distinction between substance (matter) and free space (the arena of action and the seat of energy) was provided for.

These fallacies of "misplaced concreteness" and "simple location" were so firmly established in modern physics that they were presupposed in the earlier types of the modern electron theory which replaced the older atomic theory. The attempts to ascribe a definite shape and diameter (but not color, etc.) to the electron are illustrations of the continued influence of the "mental set" appropriate to naive materialism.

In philosophy, as is well known, the first definite attack

upon this theory begins with Bishop Berkeley. Contemporary philosophers completely free themselves from slavery to conventional habits of thought when—carrying Hegel's idea that *a thing is the law of its states* still further—they recognize that the concept of anything is simply the law of its behavior: *a thing is what it does*. It must be noted, however, that the properties which a thing exhibits depend as much upon the environment the thing is in as upon the thing itself. The "thing itself" is simply the more or less permanent possibility of behaving in specific ways in different environmental settings.

The scientific revolt against the materialistic view came later on, and the emancipation has come from a different route, experimental rather than epistemological. The discovery that the mass of an electron is not the same always and everywhere, but is a function of velocity, was a serious blow to the materialistic theory of substance. For if your definition of matter is put in terms of mass, and it is subsequently discovered that as the velocity of the electron increases the mass also increases, then, as R. A. Millikan has pointed out, *matter is actually being created!* Thus the old law of the conservation of matter goes overboard.

A second blow to the materialistic theory was dealt when Einstein showed that energy and matter are not two mutually exclusive entities, but are related to each other in an intimate manner. This association has become so contagious that in order to express the mutual interdependence of the two realities such terms as the "dematerialization of matter" and the "materialization of energy" are resorted to. The relation between matter and energy has indeed become so reciprocal that it reminds one of those South Sea Islanders who are said to make their living by taking in each other's washing!

The last, and probably fatal, blow was struck when experiments showed that each of these two supposedly independent forms of physical reality, matter and energy (radiation), possess properties hitherto reserved exclusively for the other. The overthrow of materialism is completed when the view is adopted that what we formerly considered to be a particle has some of the properties of waves, while what was formerly regarded as a purely wave phenomenon (radiation) behaves in some respects like a corpuscle. Such a view is disconcerting, for, as C. J. Davisson¹⁰ remarks, this is like saying that cats are rabbits and rabbits are cats.

This evolution of the concept of the elementary particle may be summed up in the statement made years ago by Karl Pearson: *matter is non-matter in motion*. It is now evident that whatever our new theory is to be (whether Einstein's unitary field-theory or some other), the notion that matter is something sharply delimited from surrounding space must be discarded. When an important fact needs to be kept in mind there is everything in having a name for it, as Mrs. Ladd-Franklin has pointed out in another connection. Hence the timeliness of the suggestion of A. S. Eddington that we coin the term *wavicle* to express this mutual infectedness of "waves" and "particles."

As is now generally known, the first suggestions towards such a synthesis came from L. de Broglie, who advanced the idea that every mechanical phenomenon is in some sense a wave phenomenon. This analogy between mechanics and optics was developed and made more exact by Ernst Schroedinger in the doctrine of wave mechanics. Various physicists have pointed out that there are some aspects to this doctrine of wave mechanics which are still

¹⁰ "Are Electrons Waves?", *Journal of the Franklin Institute*, May, 1923.

unsatisfactory, and that the view will have to be modified in the future. But the fundamental idea, that matter and wave phenomena must somehow be assimilated to each other, is not likely to be abandoned, though the particular way in which this underlying unity of physical phenomena is to be stated may be altered in some respects. And it is this permanent significance of wave mechanics which justifies the philosopher in trying to sift out the broader implications of the view.

The way in which energy-fields are concerned in the manifestation of consciousness will be dealt with elsewhere. We will now only point out that mental phenomena are conceived to stand in relation to physical processes as a water wave does to the molecules which compose it. Here new phenomena appear which make possible the application of the differential equations as employed by hydrodynamics, even though the "material" entities of which the liquid are constituted are discrete. The averaging effect which produces the macroscopic behavior involves an interlacing of the atomic and molecular fields of force. It must be kept in mind that for us the term "ether" is but a name for the fact of dynamic interaction of parts, and that the second law of thermodynamics (which can be interpreted as an expression of the tendency of the ether to gain energy at the expense of matter) is here understood to be a name for the tendency of material particles to come to some common basis of functional pattern.

As here interpreted, all emergence takes place within the domain of physical reality, or the space-time-matter manifold. It should be pointed out that in taking this stand we are not attempting to represent in three dimensional space the properties of psychic reality. This means, for example, that the experience of a color quality is held

to be identical with the total bodily condition of that quality. But while a secondary quality is thus conceived to exist only in the head (of the perceiver) and not in the external world, and in that sense is "subjective," it is nevertheless held to be in and of the physical world—specifically that part of the physical world which is the brain.

Human consciousness may be regarded as a new dimension, and in that sense as an emergent from human bodily processes. As has been noted by others, the wave which we see moving over the surface of the water is composed of molecules which move in but one direction—up and down—and yet the crest of the wave moves forward in a new dimension—horizontally. May not consciousness itself be regarded as such a phenomenon, in the sense that it emerges out of the synthesis of neuronic frequencies and represents the constellation of ether-patterns accompanying cortical rhythms? The "ether" need not be the ether of the electron. In an electromagnetic field of force the electric and magnetic vectors are at right angles to each other. Perhaps the ethereal components of brain processes are perpendicular to the coördinates of the manifold which represents the cortical processes as objectively viewed. If wave mechanics requires six dimensions to explain the radiation of light by an atom, is it likely that the psychologist can get along with fewer dimensions? I think not.

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MATHEMATICAL ANTINOMIES

FOR as long as we know, men have used rational processes in order to arrive at truth or to support their convictions, and have thus relied upon the validity of reason. And for as long as we know, though more infrequently, other men have attacked these arguments by showing that their opponents, or rationalists in general, must arrive, by the use of reason, at two conflicting conclusions. Such a result is a paradox, with which we have to deal in this paper.

Paradoxes are a much more serious problem for the philosopher than is generally supposed. It is not enough to consider a paradox as a child's game, or as a rather interesting form of puzzle; and to ignore it as a thing apart. For if there is only *one* paradox which cannot be broken down, reason can no longer be trusted and we can only revert to a complete scepticism. Rationalist philosophers of the past have realized this, and have attempted, with varying degrees of success, to explain the paradoxes of Zeno, which for almost twenty-four centuries remained the only paradoxes worthy of serious consideration. But within this last century there has been developed a series of mathematical antinomies which so far have been ignored by practically all philosophers. These, therefore, constitute our main problem.

Paradoxes, on inspection, group themselves into two classes: those in which there is a definite logical contra-

diction, and those which simply violate our more fundamental conceptions. The former alone are true antinomies.

Antinomies may be broken down directly if one or both theses are falsely urged, or may be converted into a paradox of the second type by the challenging of one of its premises. As the premises of a worth-while antinomy are important and unsuspectingly accepted parts of human belief, it is necessary not merely to challenge, but to propose a satisfactory substitute for the challenged premise.

A paradox of the second type may be disproved directly; or it may be shown that there is only an apparent contradiction in its conclusions; or finally, we may accept the paradox and revise our outraged preconceptions.

The most important of the antinomies which are unsolved at the present time are those dealing with various aspects of the mathematical idea of infinity. They are as follows:

The series of all ordinal numbers, which must obviously be a well-ordered set, has for its type an ordinal number greater than any in the set, yet all ordinal numbers are in the set. Similar to this is the paradox of cardinal infinity; that the set-of-all-sets must include all its subsets as elements (as they are also sets), and yet the set-of-all-subsets-of-the-set-of-all-sets, which can be put into one-one relation with part of the set-of-all-sets, is nevertheless greater than the set-of-all-sets (by Cantor's proof). And finally, the set-of-all-sets-which-do-not-include-themselves, includes itself if it does not include itself, and does not include itself if it does include itself.

The simplest and easiest way to attack these antinomies is by denying that infinity exists. It is not only simple, it is too simple. For it is not enough to say that the subject of a valid paradox does not exist. Reason must apply not only to existence, it must apply to its own, that

is to rational systems. Indeed, the latter is much more fundamental than the former. Nature may possibly be irrational, but that rational systems themselves should be irrational is utterly inconceivable. To deny the existence of infinity does not remove, but only augments our difficulty. And secondly, if we are to deny infinity (method two above), we must show that everything is as satisfactorily explained without as with infinity. It is this that philosophers have frequently ignored; and Bertrand Russell has thus been led to protest that most philosophers who have considered the problems of infinity do not even know what infinity means.

Bearing in mind the necessity of altering our premises rather than denying them, a number of possibilities occur. For example, we might redefine set in such a way that all sets include their subsets. Then all sets include themselves and the last antinomy cannot arise.¹ But the most interesting solution of these antinomies is the "Doctrine of Types" proposed by Bertrand Russell, which we will now

¹ A good reason for so doing can be found in the ordinary usage of the concept "set." A library is a set of books. The owner of a library is asked whether it contains the *Encyclopedia Britannica*; he answers in the affirmative. Yet, strictly speaking, he should answer "No, but my library contains all the books which the *Encyclopedia* contains," for the *Encyclopedia* is not a book, but a set of books, and a library is not a set of sets of books. Similarly the owner of the library will say that it contains Plato's *Republic* or Parmenides' *Fragments*, yet really the library contains books which in turn contain those works.

And we may not avoid this conclusion by considering a library as a set of printed works, rather than of individual volumes; because even then there will be many contradictions between the way we use the terms in philosophy and the way we do in life. The *Fragments* of Parmenides do not constitute a work, yet does not the library contain them? And if the *Encyclopedia* is taken to be a work, does not the library contain the volume FAL-FYZ?

The set of books which we call a library, contains, then, not only the books within it, but the sets of books, the works, the bindings, the pages and the paper of which they are made, and the words on the pages. And it follows also that there is no definite number of elements in a set. My library may contain a thousand books, but five hundred thousand pages, a hundred million words, but only four types (folio, quarto, octavo, duodecimo). If the whim seizes me to count in that way, my library contains five elements, the subset of brown books, of black books, and of red, green, and blue. And if I refuse to analyse it in any way, my library consists of only one element, the library itself. That is to say, the set contains itself.

consider. Our approach to the theory is entirely different from his, but the results are identical.

It is both obvious and accepted that we cannot define anything in terms of itself. To do so is to invite one of two possibilities: either that we have not limited ourselves in any way, or that we have limited ourselves too much. If I say that houses are houses, I have limited myself not at all, and everything can or can not be a house; if I say that houses are everything except houses, I have limited myself too much, and if anything is a house it is not a house, and if it is not a house it is a house. Mathematically, if I define x as x , ($x = x$), then I am unlimited, and anything can or can not be x . If I define x (x being limited, say, to ± 2), as $-x$ ($x = -x$), then if x is $+2$ it is -2 , and if it is -2 it is $+2$. Logically, if I say: "This statement is true," then it either can or can not be true. If I say "This statement is false," then if it is true it is false, and if it is false it is true. The antinomy of infinity is exactly parallel to this. In the case of the set-of-all-sets-which-include-themselves, it either can or can not include itself. In the case of the set-of-all-sets-which-do-not-include-themselves, if it includes itself it does not include itself, and if it does not include itself it includes itself. Our rule is that *a thing cannot be defined in terms of itself*, or that *the domain of a thing cannot be a function of the thing*, or that *a thing must be defined before its functions are defined*. These three forms of the rule are perfectly equivalent.

Now, when we speak of the set-of-all-sets, we violate this rule. For the domain of the set-of-all-sets is "sets," and the latter is a function (universal-particular) of the former. Or, the set-of-all-sets being a function of "sets," the latter must be defined before the former. But we can-

not define the latter, as a universal, until the former is defined.²

These considerations lead us to a reconsideration of the concept "set", in order to prevent the occurrence of this violation of our rule. A set is a function of its elements, and therefore "elements" must be defined prior to "sets." It follows that a set cannot be an element, the latter having been defined prior to the former. Having defined this element₀ and set₀, however, we may proceed to define a new term, element₁, as including both elements₀ and sets₀. Then we may define set₁ as a set of elements₁, and so on forever. Thus set_n can include elements₀ and sets of any type from set₀ up to set_{n-1}, but may not include sets_n. No set, therefore, includes itself.

The method we suggested before as an example was to define sets so that they always include themselves. Russell's is the exact opposite. Both methods are open to this objection, that they only avoid, not settle, the issue. If Russell and his followers speak only of the set-of-all-sets-of-the-nth-degree, and never of the set-of-all-sets-of-all-degrees, they do not need to consider the antinomies. But it does not seem to be impossible to consider sets of all degrees. Such a thing seems to have a perfectly definite meaning, and if so, we are at liberty to consider the set-of-all-sets-of-all-degrees, and all the old antinomies rearise. And as long as this possibility remains, the rationalist problem is not solved. It is necessary not only to show that the antinomy can be avoided, but that it cannot occur.

And if our ordinary views as to the nature of classes are correct, it would seem that it must arise. A set, or

² Lest it be thought that I have contradicted myself, I should explain that either "sets" or "set-of-all-sets" may be considered the function of the other. In the first place, "sets" is a universal, and therefore a function of its particulars, of which the set-of-all-sets is one. Secondly, a set is a function of its elements, and the elements of the "set-of-all-sets" are "sets."

class, consists of those things corresponding to a particular definition; i. e., the set of x consists of those things corresponding to the definition of x . We have thus defined "set." Corresponding to this definition there is a set, the set-of-sets.³ Thus is reinstated the antinomy of cardinal infinity. Now this set includes itself. The set-of-any-natural-object does not include itself. Thus there are sets which do and do not include themselves, and our third antinomy likewise reoccurs.

From this it is apparent that, given the usual connection between "class" and "definition," we must still encounter our paradoxological difficulties. And simply to change this definition or connection is not enough; we must show that it is faulty.

This then is what I am attempting to do. I claim that the ordinary conception of "class" or "set" is illegitimate, because it is a confusion of two distinct things, two distinct types of set.

The first type is that generated by the enumeration of its elements. This type I will call "closed set" and designate by the symbol O . The second type is that generated by a definition and which cannot be generated by enumeration,⁴ for which type I will use the name "open set" and the symbol C . In the case of a O it can be definitely stated that these (enumerated) things are included in the

³ Definition of natural object (x).....Set of (X)
Definition of "set".....Set of "sets"

⁴ Which has not been generated by enumeration. The set of all printed books is to me an open set; irrespective of the theoretic possibility of listing all printed books. When someone publishes a complete index of all printed books, and shows that none have been omitted, then the set of all books will be a closed set. That it makes a real difference is shown by the following argument. At present, I can definitely say Ueberweg's *Geschichte der Philosophie* belongs to the set of all books—the book lies before me on the table. I can say definitely that Socrates' "Meditations sur la Philosophie de Berkeley" does not belong to that set. But I cannot be sure whether Clarke's "Observations in Africa" belongs to the set or not. It is for this reason that the set is open. Once the index is made available, I can see if that title is enumerated, and if it is not, I will know definitely that it does not belong to the set of books, which will then become a closed set.

set, and that everything else is not. In the case of an C, we can say that certain things belong to the set, but this is not exhaustive. As we cannot exhaust the elements of the C, we cannot go on to say that everything else is excluded from the set. It may be (and usually is⁵) possible to enumerate some things which are not in the set, but ordinarily this list is also non-exhaustive.⁶ And there may be things which cannot be said either to belong or not to belong to the C.⁷

Now, having made this distinction, our antinomies disappear. If we are concerned with O's, there is no O-of-all-O's, but only an C-of-all O's. Obviously there can be no question as to its including itself, as it is of a different nature from what it includes. If we are concerned with C's, then we have no longer the dilemma of an C containing itself or not containing itself. An C may be proved to contain itself, or it may be proved not to contain itself, or it may be indeterminate. Here we must carefully avoid recurring to our difficulties. For, if we make three divisions: the C-of-all-C's-which-include-themselves, the C-of-all-C's-which-do-not-include-themselves, and the residue C-of-those-C's-which-may-or-may-not-include-themselves, and consider that this situation forms a trilemma such that any C must belong to one and only one of these three divisions, we would still have our old antinomy. But this is not the case. An C belonging to the third category is not thereby excluded from the first or second.

A number of the implications of this view are interesting to consider. In the first place, we must make a dis-

⁵ But not always. The set of everything is an C such that nothing can be named which is not in the set.

⁶ But not always again. The C of all things except the number zero is an exception; and similarly the inverse-set of any O is an C of this type.

⁷ The C of all things which are not included in this C is the extreme case. Anything may be said to belong or not to belong to the set.

inction between infinity as a number, and infinity as a process. Using ∞ as a generic symbol for infinite numbers, both cardinal and ordinal, we will adopt the symbol α for infinite processes. The concept ∞ is philosophically illegitimate, although it is quite satisfactory for mathematicians to use either it itself or any of the transfinite cardinal or ordinal numbers which it represents. Such numbers are "imaginary," and their use is analogous to that of i , the square root of -1 .⁸

In addition to using the present system of transfinite mathematics, we may erect a new one by using exclusively the concept α . In this system we will find that some of the old transfinite theorems hold, but that others break down. Among those that break down, as we have shown before, are those concerning the antinomies of infinity. The system explains a fact which is apparent, but unexplained, in the usual system: namely, that infinities cannot be subtracted from or divided by other infinities. If from α (a cardinal process or series), we subtract n , a new process results, such as $0-n$, $1-n$, $2-n$, $3-n$, - - - -, which is identical with the original series. Similarly in the case of $\alpha \div n$. We are dealing, that is, with a directed variable, which can be compounded by any arithmetical method with one or more constants; a new directed variable resulting. But two directed variables cannot be compounded to produce a definite directed variable. Each variable being independent, the order of compounding remains indeterminate and any number of different directed variables may result from various methods of compounding. A special case arises where all methods of compounding two or more directed variables produce new

⁸ The analogy may be extended by making an antinomy out of $\vee-1$. $i \times i = -1$. If i is -1 , it must be $+1$, and if it is $+1$, it must be -1 . And if the $\vee-1$ is analogous to the set-of-all-sets-which-do-not-include-themselves, the $\vee+1$ is analogous to the set-of-all-sets-which-include-themselves.

directed variables which have a quality in common. Thus, in the special case of addition and multiplication of two α 's of the same order, the various indeterminate resulting variables are all of the same type as the original α , and it may be said that $\alpha_n + \alpha_n = \alpha_n$, or $a_o \times a_o = a_o$.

A curious aspect of this system is that Cantor's proof that $2^n > n$ breaks down. $2^{\alpha(a_o)}$ is the process $2^0, 2^1, 2^2$, etc., which is $\alpha(a_o)$. That is, $2^{a_o} = a_o$, when a_o is a process, not a number. Consequently there is no mathematical method of producing an infinity of a higher order than a given one, and the antinomies of cardinal infinity do not occur. All orders of infinity must be generated by some method other than mathematical, and as a result it seems likely that there are not more than two or three orders of infinity: a_o , the infinity of a discrete series; a_1 , the infinity of a continuum; and possibly a_2 , the infinity of an infinite collection which cannot be ordered.

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THE PROBLEM OF INCOMPATIBILITY IN THE PHILOSOPHY OF ORGANISM

THERE is one question that must have troubled many of Prof. Whitehead's readers in the last few years: the question of metaphysics. I say, troubled; because for most of them it had been answered and done with long ago.

For, ever since it first occurred to John Locke, meeting with a group of friends in one of those genial discussions where the problems of the universe are settled over the tea-cups, that "before we set ourselves upon inquiries of that nature, it was necessary to examine our own abilities, and see what objects our understandings were or were not fitted to deal with,"¹ the conviction has grown that, not the world at large, but the mind of man is the proper subject for philosophical study. Sufficient witness thereto were the titles of some of the main philosophical works of the seventeenth and eighteenth centuries: Locke's own, *Essay Concerning the Human Understanding*; Hume's, *Treatise on Human Nature*, and *An Enquiry Concerning Human Understanding*; and Kant's three Critiques: which would show plainly enough that the concern of these thinkers was no longer to explore the universe in terms of a system of concepts, but rather to examine the adventurous reason itself, define its capacities, and expose its limitations. There were exceptions; but, of these, Leibniz was a voice crying in the wilderness; and the logical romances of the nineteenth-century idealists were always taken with a grain

¹ *Essay Concerning Human Understanding*, Epistle to the Reader, p. 9. Mary W. Calkins ed.

of salt, admired as works of imagination rather than credited as so much information about the nature of things.

And now there comes a man who is neither a romantic poet nor a religious apologist; who would hardly be deemed deficient in scientific sophistication (being himself conversant with mathematics and physics, and a mathematical logician of no mean repute); and who still proclaims himself the champion of "speculative philosophy." Common thought, even common language, he tells us, is instinct with metaphysics; common sense being itself a species of metaphysics, not least ambitious for keeping to the dark. The question is not whether one shall speculate or not; it is rather how one shall speculate, and whether one shall use tacit and dogmatic, or acknowledged and criticized, assumptions. In proof whereof he gives us a cosmology of his own, an endeavor "to frame a coherent, logical, necessary system of general ideas in terms of which every element of our experience can be interpreted."² Nor is this done in defiance of the ego-centric predicament which imprisoned Locke, Hume and Kant in epistemology: unlike the neo-realists who cheerfully cut the Gordian knot, Prof. Whitehead patiently unties it; accepting the subjectivist principle, "that the whole universe consists of elements disclosed in the analysis of the experiences of subjects,"³ he frames his metaphysics in those very terms which enable him to cope with the theory of knowledge.

Is he right? I do not propose to answer that question. My aim is less ambitious: to take my reader with me a little way in a pragmatic—pragmatic in method, not in creed—enquiry, which would judge the system in question not on any preconceived standards, nor even by Prof

² *Process and Reality*, p. 4.

³ *Ibid.*, p. 252.

Whitehead's own criteria of coherence, logical force, and necessity (since to do either would be to beg the question from the start), but by observing the system in action. I start with a problem. I go to his philosophy, and ask how much light it throws on my problem. By its fruits I shall know it.

1. *The Problem: Incompatibility*

Although the problem has figured prominently in recent discussions of foundational logic,⁴ no explanation of it has yet been given in terms of the familiar "atomic," non-symbolic logic. I may well begin my account by touching on this phase of the subject.

Consider for a moment the following propositions:

1. Socrates has long, black hair.
2. Socrates has short, black hair.
3. Socrates has short hair.
4. Socrates has long, white hair.
5. Socrates has gray hair.
6. Socrates is bald.
7. Socrates is this man, (as he might have been pointed out by a contemporary Athenian boot-black).
8. Socrates is a town in Kansas.

The observed incompatibilities in these propositions throw some light on the meaning of the term:

A. No two of these propositions are necessarily incompatible unless we assume that they refer to the same subject, Socrates. Identity of subject is, therefore, presupposed in the assertion of incompatibility.

B. No two are incompatible unless they fall within the same universe of discourse. Propositions 1 and 8 are not properly incompatible; they are irrelevant to each

⁴ Cf. H. M. Sheffer, *Trans. Americ. Math. Society*, vol. xiv, pp. 481-8, especially the last three pages; Whitehead and Russell, *Principia Mathematica*, 2d ed., new introduction to vol. I; and Bertrand Russell, *Introduction to Mathematical Philosophy*, ch. xv.

other. To say that a town in Kansas has long, black hair, is neither true nor false: it does not make sense.

C. Two propositions, with a common subject and in a common universe of discourse, are incompatible, when they present different "determinates" under the same "determinable."⁵ Take 1 and 2: their common determinable, "having black hair of any length" has different values, "long" for 1, "short" for 2. In the same way 1, 4, and 5 agree in the determinable "having hair of any color," but disagree in presenting the incompatible determinates "black," "white," and "gray." So 1 and 6: the determinable is "having hair," with positive and negative determinations.

All determinable things are singly determinate.

x is a determinable thing.

Therefore, *x* is singly determinate.

The middle term "determinable things" could be further explained as, "subjects whose predicates represent one species of quality under a distinct genus"; or, in less traditional terms, as "subjects whose predicates are particular values of a given function." But the minor term, "singly determinate," can only be discussed by leaving deductive for inductive or empirical logic. Here we find that it can be analysed into:

(1) Perspective of determination. Strict incompatibility between propositions with diverse determinates (i.e. 1, 2, 5, and 6) implies that they all refer to the same time and place. It is quite possible that Socrates had long, black hair at one time, short, black hair after a visit to the barber the next week, gray hair twenty years after, and none at all at the time of his trial; and at a given time his hair may have been long and black in one part of his head,

⁵ The terms are borrowed from W. E. Johnson, *Logic*, vol. I, chaps. xi and xii; I am not sure, however, that he would agree to the wider sense in which I use them.

short and black in another, and gray about the temples. To state the date and place of the determination in terms of the perspective of one observer so that it shall be translatable into the perspectives of other observers, may seem simple enough in this case; but elsewhere—i.e. in modern physics—it can only be done through the complicated formulas of the theory of relativity.

(2). Standard of measurement. "Long" and "short" are relative terms. A haircut that may have seemed indecently short to the esthetic Athenian, may offend by its length the hygienic sense of the modern American. Nor is this evaded by substituting feet and inches for the vague terms "long" and "short." On the contrary, numerical measurement brings out, that all measurements are made with regard to certain standards fixed by convention, and assumed to remain unaffected by the lapse of time or by their transportation in space.

The moral of this seems to be the relativity of incompatibility:

It seems possible to speak of a "more or less" of incompatibility. Every determinable defines a continuum of possible determinates. There is an infinite number of shades of color, one hue passing into another through an infinity of intermediaries of apparently imperceptible difference. So number defines a continuum of natural, rational and real numbers; so sound, shape, etc. How great need be the difference between two shades of color, or between two decimals, before we can pronounce them incompatible? How much hair must a man lack in order to qualify as bald? The question is an old one: the perception of infinitesimals. Hume had at least the courage to acknowledge it, if not the wisdom to answer it. (Cf. *Treatise*, Part iv, Sec. vi, pp. 537-9, Greene and Grose ed.)

It seems necessary to specify the context in which incompatibility is asserted. "x is a circle" and "x is a square"—are these two propositions incompatible? The question is unanswerable unless we specify in what context those figures appear. If the context is that provided by the postulates of Euclidean geometry, then we can positively assert their incompatibility. Otherwise, it is only a matter of ingenuity to construct a set of postulates where a round square is a commonplace. Paradoxical as it may seem, this further relativity of incompatibility to context seems the best suggestion out of the difficulties of the former relativity of the "more or less." Can we safely affirm that two observations, which agree to the third decimal, are not incompatible? "For all practical purposes" we can. For purposes of exact determination we cannot.

Such specialized uniqueness of determination—the banishing of the "more or less" of incompatibility through narrowing down the point of reference with respect to which that incompatibility holds—is well illustrated in art. A work of art consists of the subordination of details to a pattern, so that elements quite compatible in other contexts become mutually irreconcilable if severally inimical or indifferent to the specific aim of the artist. Take, for instance, the words "sidewalk" and "pavement," words with exactly the same meaning, and almost the same rhythm. Try to substitute "sidewalk" for "pavement" in the following lines of Yeats—where the context is one of powerful harmonies of vowel-values—and the result is disastrous:

"I will arise, and go now, for always night and
day

I hear lake-waters lapping with low sounds by
the shore;

While I stand on the roadway, or on the *pave-
ments* gray,

I hear it in the deep heart's core."

In the same way the perfection of the proportions of a great building like the Parthenon consists in the delicacy of workmanship, that pursues excellences so minute—as in the entasis of the columns or the curvature of the stylobate—as to be imperceptible to the eye, yet marvellously to contribute to the felt rhythm of the whole.

Germane to this is the question of ethical self-consistency, or the incompatibility of given acts with professed principles and pursued ends. An object of desire, like any determinable, defines a continuum of determinates: such and such a "sort of thing" is wished for; and this, subject, of course, to the limitations of the powers of the agent and the fertility of the environment, may be realized in an infinity of actual situations, each achieving the projected satisfaction, though each in a slightly different context. For instance, I desire a drink of water. I may get my drink in a receptacle of any sort: glass, cup, or jug of an infinity of possible shapes, makes, colors, etc.; or I may drink it, a la Turca, in my hand from a faucet, again with innumerable possible faucets; or I might even conceivably lap it up, like Gideon, from a running stream, and do this again in an infinity of alternative ways. In all these cases the desired end would be perfectly, though variously, attained. The question of the "more or less" would enter in when,

1. Environmental limitations were such that water we unavailable, and I should have to quench my thirst with a substitute: an orange, tea, milk, or—ὅ μὴ γένοιτο—wine.

2. My initial desideratum were not simply the function of a single interest, but represented the intersection of more interests, i.e. esthetic, personal, or ritualistic: this

sort of drink, from the hands of this sort of a person, under this sort of conditions.

In either case an infinity of possible consequences would arise, each more or less incompatible with the given end. The only way of ultimately pronouncing upon moral incompatibilities, would be on the basis of a critique of ends or standard of values, which, in unreflective behavior, instinct so quietly and efficiently provides.

For all its sketchiness, this discussion must have made at least one thing clear: the nature of a "non-metaphysical" treatment of a general concept. The maxim of such a treatment is—strangely enough—Platonic: "To keep on the safe side, one must be most on his guard against resemblances: they are slippery old things!"⁶ Its ideal is to treat the problem separately for each of the fields wherein it occurs—deductive or inductive logic, esthetics, ethics, etc.—and ascertain its precise import in each case in concepts primarily applicable to that particular field, and not necessarily meaningful in any other. The actual fact that certain terms carry over from one field into another seems, for this point of view, a matter of no great consequence, due to the vagueness of language, rather than to any intrinsic equivalence of the problems involved. To unify these different kinds of incompatibility, as they meet us in separate fields of experience, under a single concept, and to explain that general concept itself by exhibiting it as an element in an even larger system, this "non-metaphysical" standpoint would regard as neither feasible nor opportune. It is to just such an attempt to understand the problem of incompatibility by determining its place in the wider scheme of experience as a whole, that I now turn.

⁶ *Sophist*, 231a.

2. *The System: The Philosophy of Organism*

A. The One and the Many.

The world consists of many individual elements; but it is one world, because each of these elements is a center of experience, mirroring—with various degrees of relevance—the whole world. Three basic principles will serve as a necessary commentary to this hasty summary:

1. The Ontological Principle: “nothing is to be received into the philosophical scheme which is not discoverable as an element in subjective experience.”⁷ Let no one be alarmed over the subjectivistic smack of such a statement. It only means: what *is*, is *in* experience, or *an* experience. The world, being, reality, existence, or whatever other term one wishes to use to describe the metaphysical situation, is to be conceived as a complex of experiences, in which no element appears, save as a subject of, or participant in, some experience. Centers of experience, therefore, (“actual entities,” “actual occasions,” or “actualities”) are the fundamental units, in terms of which everything else is to be understood.

2. The Principle of Relativity: “every item of the universe, including all the other actual entities, are constituents in the constitution of any one actual entity.”⁸ The ontological principle says, everything that is, is actual. The principle of relativity adds, each thing is what it is, because everything else is what it is. It comes as a flat denial of the old notion of substance as “an existent thing which requires nothing but itself in order to exist”:

“every actual entity is in its essence social and requires the society in order to exist. In fact, the society for each entity is the all-inclusive universe.”⁹

⁷ *Process and Reality*, p. 253.

⁸ *Ibid.*, p. 224.

⁹ *Religion in the Making*, p. 106, and p. 108 (latter abridged).

"Prehension" is the word which the author has coined to express this fact of universal connectedness, a connectedness that can best be understood as the unity of the experienced world in an experiencing subject. This sounds quite close to Kant; and it is—its exact opposite. Kant says: the unity of the world is the product of the perceiving mind. Prof. Whitehead says: perceiving (prehending) minds are the products of the unity of the world.

3. The Principle of Intensive Relevance: "any item of the universe . . . has its own gradation of relevance, as prehended, in the constitution of any one actual entity."¹⁰ So far we have been told of a world, a connected world, a world of many things. Now we are told of a world of many *different* things. For if everything prehended impartially the whole world, and the whole world was nothing but the sum-total of these prehensions, then all prehensions, uniform summaries of the same world, would be exactly alike. "Relevance" introduces the differentiating principle. Prehensions are different, because they prehend differently: while every item in the universe figures in each prehension, it figures much more significantly in some than in others: all are invited to the feast of prehension, but the seats of honor are reserved for a few.

B. Change, Permanence, and Value.

We start with change: "that which is always becoming, and never really is"¹¹: the flux, process, the passage of nature, "the creativity whereby the actual world has its character of temporal passage to novelty."¹² It is the other side, "that which always is and never becomes,"¹¹ that needs explanation. Recurrence is a half-way house between permanence and change. This is expressed by the universals, "forms of definiteness," "ideal entities," or

¹⁰ *Process and Reality*, p. 224.

¹¹ *Timaeus*, 27d.

¹² *Religion in the Making*, p. 90.

"eternal objects." But these, like everything else, are subject to the Ontological Principle: they have no being apart from events whose character they define. If so, how can they furnish the basis of permanence? The answer is a kind of Augustinian Platonism: forms are eternally relevant to the passing world, by virtue of their inclusion in the "primordial appetite of God." God is the first-born of the creative process: the original envisagement of all eternal objects as possibilities for realization within the temporal world.

The two problems—the one and the many, permanence and change—meet in the concept of "concretion" or "concrecence," "the process in which the universe of many things acquires an individual unity in a determinate relegation of each item of the 'many' to its subordination in the constitution of the novel 'one.'"¹³ How does the new individual come into being? By a certain kind of prehension, with a specific kind of relevance. Relevance of what, and to what? Of the whole universe to the purpose, or "subjective aim" of that entity. For every actual entity, in the beginning, before it is anything else, is a subjective aim, an "appetition," an ideal, a desire restlessly seeking satisfaction. This is the selective unit, the principle of novelty. It operates upon the environment, which is that part of the creative process which has preceded it, and which is now the "datum" "objectified" for the subjective aim, the raw material in which this as yet formless will may achieve a concrete realization. This is value: the satisfaction of interest. And the measure of value is the fulness, or "width" and "intensity," or concreteness of the satisfaction.

3. *The Problem in the System*

And now the answer to my problem: Compatibility, in

¹³ *Process and Reality*, p. 321.

the generic sense, means togetherness of feelings in an actual occasion. First, an application of the Ontological Principle: "If some group of items . . . can coexist in one actual entity, then the group . . . is a compatible group."¹⁴ Then, a specification of the elements which may thus co-exist, in which the author might have well referred to the etymology of *in-com-pati-bility*: " 'Feelings' are the entities which are primarily 'compatible' or 'incompatible.' "¹⁵ Incompatibility appears in the genetic process of concrescence. It figures here in two ways:

1. Within the subjective experience of the concrescent entity, it safeguards the unity of the projected aim.
2. In the "objective immortality" of the achieved satisfaction, it fixes the character of its contribution to the concrescent process as a whole.

Let me explain:

1. Incompatibility in the Self-Realization of an Actual Entity.—An actual entity is like a cell, "appropriating, for the foundation of its own existence, the various elements of the universe out of which it arises."¹⁶ It is an organism with needs—its subjective aim. Its life—the concrescence—is a series of phases in which those needs are progressively fulfilled, by continuous adaptation to its environment. That adaptation is necessarily selective: its "initial datum" is the selective field; its "subjective aim" is the selective standard; the "feelings" or "prehensions" are the selective acts. Those elements in the environment which cannot be together selected as jointly subservient to the subjective aim are branded incompatible.

A paradox arises here: Unlike the biological organism of the preceding paragraph, an actual entity in its inception is not a full-grown agent, does not yet exist, is not yet

¹⁴ *Process and Reality*, p. 225.

¹⁵ *Ibid.*, p. 225.

¹⁶ *Ibid.*, p. 335.

actual at all, but only a candidate for actuality, only a wish, a hope, a dream seeking realization, with its purpose as its only foothold upon existence. How then can we speak of selection (or "feeling," which amounts to the same thing), as if we had a mature subject capable of adaptive action towards envisaged ideals? The First Category of Explanation, the Category of Subjective Unity, is our author's way out of the impasse: in which we are given to understand that the projected satisfaction—which is the aboriginal *ratio essendi* of the entity—is already operative from the very beginning of the concrescence, eschewing incompatible elements that would lead to feelings ultimately disloyal to the transcendent end.

2. Incompatibility in the Determinate Character of the Actual Entity.—If incompatibility has a very definite ego-centric significance, its meaning is also objective. The concrescence of the actual entity once completed, it has ceased to be a subject, it has now become an object; and an object, we are told, is "its capacity for being a realized determinant of process."¹⁷ The mature satisfaction can now look forward to an "objective immortality": its definite contribution to the growing universe, its specific influence on every future concrescence. Incompatibility here spells the uniqueness of the rôle which that satisfaction must play in the ensuing episodes of the concrescing universe. No matter in what satisfactions it is incorporated, no matter how many times it is cast and recast, it always retains its modicum of stubborn individuality, its ultimate incompatibility with all that is not itself. Such an interpretation of the "laws" of Self-Identity, Non-Contradiction, and Excluded Middle is what we are given in the Second and Third Categories of Explanation. They state the "grounds" of incompatibility: that a complete satisfaction

¹⁷ *Ibid.*, p. 336.

has a character which, good or bad, is at least definite beyond "the shadow of a doubt"; definite by reason of what it is not, as well as by virtue of what it is;¹⁸ and that this definiteness, once actual, remains inviolate forevermore.

Incompatibility, thus generically defined, may be further explained in terms of two supplementary concepts: pattern and contrast. They both refer to the specific context—ideal or actual—in which two elements may or may not be incompatible. Pattern is the "manner" or mode of togetherness. Contrast is the realization of a pattern in experience. Richness of concreteness (which measures depth of value and intensity of satisfaction) depends on the harmonious diversity of various elements held together in feeling through a complex pattern. Incompatibility, therefore, in whatever guise it may appear—logical contradiction, scientific ignorabilia, esthetic discord, ethical conflict—is by no means an unmixed evil. For it may be transcended in a more complex pattern; then a richer harmony springs from the initial confusion: heightened subtlety and rigor of distinction in logic, greater precision and wider generality in scientific law, the larger synthesis in art, the instructed conscience, chastened desire, steeled will in moral endeavor. All of which, a pragmatist and an absolute idealist might hear with approval, and pronounce in chorus: "Thou art not far from the kingdom of heaven."

It remains to translate my previous, "non-metaphysical," discussion of incompatibility into the categories of this system:

Logical incompatibility, I said, is the relation which subsists between two propositions, in the same universe of discourse, when they present an identical subject with

¹⁸ "The fact of incompatible alternatives is the ultimate fact in virtue of which there is definite character." *Process and Reality*, p. 367.

different (incompatible) determinates under the same determinable. We first learn what a proposition is: a tale "that perhaps might be told about particular actualities,"¹⁹ the definite possibility that a certain form might qualify a given existent. Truth, therefore, is a purely adventitious property of a proposition,²⁰ a dignity which accrues to it only when entertained by a curious, anxious, adventurous being, who is the only one properly concerned with incompatibilities. The subject of a proposition is an actual entity, not in its full concreteness, to be sure, but an actual "it" which can "supply the element of givenness requisite for truth and falsehood."²¹ As for the universe of discourse, the author does not explicitly recognize the concept; yet, I think, it may be correlated to his interesting notion of "cosmic epoch," defined as "that widest society of actual entities whose immediate relevance to ourselves is traceable."²² For a universe of discourse means no more than this: Is a certain concept applicable to a given subject, so that the joining of those terms in a proposition can be significantly asserted or denied? A cosmic epoch answers just that question: it informs us of that particular structure, peculiar to our epoch and not necessarily applicable beyond it, which makes propositions not in themselves true or false, but qualified candidates for such categories. So the "determinable" and "determinate" of the previous discussion reappear, duly generalized, in the doctrine of the "interconnection between the degrees of relevance of different items in the same actual entity."²³ Incompatibles are those "groups of items" (determinates) which "in certain respective gradations of relevance" (under the same

¹⁹ *Ibid.*, p. 392.

²⁰ "Its own truth, or its own falsity, is no business of a proposition."
Ibid., p. 394-5.

²¹ *Ibid.*, p. 395.

²² *Ibid.*, p. 139.

²³ *Ibid.*, p. 224.

determinables) "cannot coexist in the constitution of one actual entity."²⁴ Having once decided, in accordance with the Ontological Principle, that "eternal objects tell no tales about each other,"²⁵ that is, that apart from actuality forms stand in no determinate relations to each other, the author is hard put to it to explain the "proximate relevance" between determinates such as red, yellow, blue, and the determinable, color. But his Augustinian Platonism comes to the rescue, and he can say that "the proximate relevance" means "relevance as in the primordial mind of God."²⁶

Perspective of determination and standard of measurement, into which I analysed the notion of "singly determinate," are discussed in the Theory of Extension.²⁷ This is considered by many the most brilliant part of Prof. Whitehead's work. Certainly it stands today unrivalled in philosophy as a consistent account of the geometry of spatio-temporal perception. To explain this in any detail were obviously out of place here. Suffice it to remark that space-time in its widest sense is interpreted as that geometrical pattern to which objectifications must conform: that general systematic character of our epoch which provides the how of the transmission of satisfactions. A perspective of determination is then the "extensive quantum" or the "standpoint"²⁸ or "duration"²⁹ of a satisfaction; a spatio-temporal slab simultaneous with that percipient, with an absolute determination of date and location within that perspective, and a given formula by which observations can be translated from one perspective to an-

²⁴ *Ibid.*, p. 225.

²⁵ I have not been able to locate this in his printed work. It is a frequent saying of his in his classes.

²⁶ *Op. cit.*, p. 173.

²⁷ See *Principles of Natural Knowledge*, Part III; *Concept of Nature*, chaps. iii - v; *Process and Reality*, Part IV.

²⁸ *Process and Reality*, pp. 435 ff.

²⁹ *Concept of Nature*, p. 53.

other. Congruence, once defined as "a certain definite analogy of function in a systematic complex [of straight lines], which embraces both congruent elements,"³⁰ the standard of measurement then becomes a convention as to the unit of congruence.

And here I would end the discussion: no surer than when I started, but wiser. My question has not been answered; for it should never have been asked; answer enough to expose it. My query concerned metaphysics, not this or that particular brand of it, but metaphysics as a whole, the general ideal of world-construction, exemplified for me more forcibly in Prof. Whitehead's cosmology than in any of the modern systems—shall I accept or reject it? And the answer was a reproof, gentle but firm: Why accept or reject it? Understand it, if you can; admire it, if you wish; believe it, if you must. But you can neither accept nor reject it. It was never meant to be so taken. It is not a weather-report or a foot-ball score, that it should be either true or false and nothing more.

There is your problem: incompatibility. You need not philosophize about it, unless you wish. If you seek to know what it means, go to your dictionary. There you will find different definitions for it: one for logic, one for inductive science, another for esthetics, still another for ethics. Ask and it shall be given you—according to what you ask: specific, practical answers, for specific, practical questions; general and useless and important answers, for general, useless, important questions. If you only knew why you asked the question, you would know how to take the answer.

³⁰ *Process and Reality*, p. 508. Cf. also *Principles*, chap xii, and *Concept of Nature*, chap. vi.

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THE PROBLEM AND POSTULATES OF EPISTEMOLOGY

1. *The nature and problem of knowledge.*

THE problem of knowledge seems to be the problem of explaining what is *explicable* about knowledge. So for the determination of what is explicable about knowledge, and what not, a proper understanding of the real nature of knowledge seems to be necessary. A thorough enquiry into the nature of knowledge is beyond the scope of this paper. The following observations may, however, be quite sufficient for our present purpose.

It may be observed at the outset that the knowledge we are to take into account in an epistemological enquiry is the concrete knowledge of our normal adult life. What the nature of knowledge is in infants, idiots, people in an unconscious or semiconscious state, etc., seems to be impossible for us to determine with any measure of certainty.

Now in any particular case of knowledge in our adult life, we may distinguish two elements, viz. (a) the subject-object relation, and (b) some judgment of fact. As regards the former element of knowledge, it seems to imply in the first place the independent existence of the object presented to the subject, and secondly the direct and immediate presentation or revelation of the object to the subject. This view of the cognitive relation or the relation between the subject and the object seems to be alone consis-

tent with the deliverance of immediate consciousness. And any view which denies the ultimate character of this relation and its implications may, therefore, be said to run counter to the verdict of common sense. The attempt to deduce the subject-object relation from a non-relational, undifferentiated, homogeneous stuff of experience is, therefore, altogether unwarrantable from this point of view.

The elements of knowledge *distinguished* above should not, however, be held to be *separable* from one another. In point of fact there can hardly be a case of knowledge in which the subject, while knowing the object, does not at the same time know it as *such-and-such*—does not, that is to say, make a judgment. This view of the inseparable relation between cognitive relation and judgment seems to hold good in so far as we mean by knowledge the knowledge of our adult life. Whether it equally holds good of any possible kind of knowledge, we cannot definitely say. In any case, the view of the *theoretical* possibility of a mere cognitive relation apart from judgment does not seem to be logically absurd. But the same cannot be said of the possibility of mere judgment apart from the cognitive relation. Judging necessarily presupposes something to be judged. The material to be judged must be directly and immediately given to the subject that judges.

Now it is a fact of experience that the cognitive judgment, immediately involved in knowledge, may be contradicted by our subsequent experiences. If, for example, we know an object as a round table on a particular occasion, and as an oval table on another, the two cases of knowledge obviously contradict each other. Both of them cannot be held to be true. So the question arises as to how we are to ascertain the truth or falsity of knowledge. If the judgment immediately involved in knowledge had never been contradicted, the question of

the determination of the truth or falsity of knowledge would never have arisen.

The question of the determination of the criterion of the distinction between truth and falsity is too difficult to be solved in the present essay. But it is undeniable that *explicit* judgments of knowledge imply *some* criterion with reference to which such judgments are made. Now these explicit judgments of knowledge may be called *logical judgments* as distinguished from cognitive judgments, immediately involved in knowledge. It may be mentioned here that by logical judgments we mean the judgments of validity which are consciously formed. Cognitive judgments may, therefore, be said to be *logically prior* to logical judgments, understood in this sense.

Now this view of the relation between cognitive and logical judgments does not necessarily mean that cognitive judgments or judgments of fact are absolutely independent of all logical value. That at least some implicit logical value may be involved in the so-called judgments of fact seems to be highly probable. The fact that we are often prompted to act on the immediate occurrence of knowledge, without waiting for subsequent experience to determine its explicit logical value, in the same way as we would have done had our knowledge been previously judged as explicitly true, seems to imply that the so-called judgments of fact have an implicit truth-value or a claim to truth. A detailed discussion of the present problem would carry us beyond the limits of this paper. All that need be observed here, has been already mentioned, viz. that knowledge in the sense of cognitive judgment, involving subject-object relation, is the necessary presupposition of, or is logically prior to, explicit or consciously formed judgments of logical value.

We are now in a position to indicate what the real problem of knowledge is, and what it is not.

In the first place, it may be indicated that if the foregoing account of the nature of knowledge is held to be true, it seems to be justifiable to maintain that any problem concerning the explanation of the relation between the subject and the object, and the implications of this relation, mentioned above, is based upon a misconception about the real nature of knowledge. The principal ground on which we have held to the ultimate and inexplicable character of the cognitive relation and its implication, is, of course, the deliverance of our immediate consciousness. It is indeed true that any argument based merely upon this ground can hardly be regarded as sufficient from the philosophical point of view. So our argument need be supported by the demonstration of the logical absurdity of those theories which treat as explicable what we have regarded here as inexplicable. But this wider task cannot be undertaken at present. It may only be urged here that the position of any theory which is in obvious contradiction with the deliverances of immediate consciousness is considerably weakened. As regards the logical difficulty of traditional epistemological theories which seek to explain the relation between the subject and the object, it may be pointed out that the very possibility of such an explanation seems to presuppose the relation of the object to the subject. It is indeed true that we are immediately aware of the object *as existing independently of the subject*, but its independent existence is something of which we are *aware*. The fact of our awareness of the object is, therefore, as inexplicable as the fact of the independent existence of the object.

Secondly it may be mentioned that though we have no reason to view the possibility of cognitive relation apart

from cognitive judgment to be as theoretically absurd as the possibility of the latter apart from the former, we may regard these two elements of knowledge as inseparable, in so far as the actual concrete knowledge of our normal adult life is concerned—the only kind of knowledge we can possibly consider in Epistemology. And therefore no real problem can arise in regard to the explanation of the relation between them.

We are, therefore, led to hold that the only genuine problem of knowledge is the problem of the explanation of the distinction between the truth and falsity of knowledge. Knowledge in so far as it is viewed to be immediate cognitive judgment, does not involve, as already observed, any explicit logical value, though it may be suspected to involve some implicit truth-value. So the question necessarily arises as regards the determination of the criterion with reference to which the explicit logical value of cognitive judgments, immediately involved in knowledge, may be ascertained.

2. *Epistemology and its postulates.*

The problem of truth and error which we have been led to regard as the only genuine problem arising in connexion with knowledge, may be said to be the proper subject-matter of Epistemology. It is indeed unusual to call a problem epistemological which is generally regarded as logical. We have no objection to calling it logical, but it seems to be more proper to call it epistemological for the following reasons.

In the first place, Logic has not always been understood in the same sense. It has passed through various vicissitudes of career. At first it was a mere enquiry into formal validity; then, a methodology of the inductive sciences; later on it was practically identified with Meta-

physics, and lastly it developed into a highly technical science called Logistic or Mathematical Logic, having absorbed within itself considerable knowledge of mathematics. Secondly, Logic may be held to be possible even by those who do not recognise the *reality* of the distinction between truth and error. Thirdly, those who do recognise the reality of this distinction do not, however, seem to regard Logic as exclusively concerned with the consideration of the problem of truth and error. Logic is with them wider than what is covered by considerations of validity alone. Lastly, if the possibility of a distinct enquiry called Epistemology dealing with the genuine problem of knowledge be recognised, and if it is right to contend, as we do here, that this enquiry in the sense of an examination of cognitive relation and its implications or in the sense of an examination of the relation between cognitive relation and judgment of fact is fictitious, we are led to hold that Epistemology must be possible in the sense of an inquiry aiming at explaining the distinction between truth and falsity of knowledge, and this, as already observed, necessarily demands an explanation.

Now it is not difficult to determine the postulates of the epistemological enquiry as understood in this essay. The problem of validity presupposes, in the first place, the *ultimate character* of the fact of knowledge with all its implications. This postulate can, therefore, be analysed into the following elements: (1) The ultimate fact of the *independent existence* of the object of knowledge; (2) the ultimate and unanalysable fact of the direct and immediate presentation of the object to the subject, and (3) the inexplicable relation of cognitive relation to cognitive judgment—knowledge as fact being understood to be cognitive judgment involving subject-object relation.

The second postulate of the epistemological problem

is the fact of the distinction between truth and error. This distinction must be held to be real in order that Epistemology may be possible. It must be noticed, however, that so far as this postulate is concerned, what is to be postulated is merely the *fact or reality* of the distinction between truth and error, but not its *ultimate or inexplicable character*. If the distinction between truth and error be held to be inexplicable, Epistemology as a scientific enquiry would be altogether impossible. So we see that for the possibility of Epistemology the *explicability* of the distinction between truth and falsity is no less a postulate than the *mere fact* of this distinction.

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CONTRADICTION, LOGIC, AND REALITY

THE aim of the following discussion is to examine the logical principle of contradiction in order to reach some conclusion regarding its applicability as a metaphysical criterion of the nature of reality. The inducement to do so arises from the fact that a very important type of metaphysical theory has accepted that principle as its foundation. Though the immediate purpose is thus limited, a wider question is involved as to the relation between logic in general and a theory of reality. To raise, concerning the principles of logic, any question affecting their validity may seem absurd. But the issue is not necessarily a denial of their validity; rather it is the sense in which they are valid. Two considerations prompt to the raising of this issue. One is that the laws of logic or thought present very great difficulty in their interpretation and formulation; and, if the laws are axiomatic, it is not at all clear why there should be this difficulty. If they are not axiomatic, there then may be reasons for the difficulty, and it may be profitable to enquire into their nature. The second is that it is not clear whether metaphysicians take their stand upon logic or whether they intrude their metaphysics into their interpretations of logic. Mr. Bertrand Russell may have good ground for saying that "Schools should be characterized rather by their logic than by their metaphysic."¹

The metaphysical theory which makes use of the prin-

¹ *Contemporary British Philosophy*, I, p. 359.

ciple of contradiction as a metaphysical principle is that expounded and defended by Bradley, Bosanquet, Taylor and others. It ascribes a metaphysical significance and priority to logical principles, which it does not ascribe to physical laws, such as that of gravitation. The reason presumably is that it adopts a very special theory of the nature of thought and of its relation to reality, and hence comes to regard the principles of logic as being expressive of the nature of reality, much as contemporary science regards the principles of a certain kind of geometry as being expressive of the nature of space.

"Ultimate reality," it says, "is such that it does not contradict itself; here is an absolute criterion. And it is proved absolute by the fact that, either in endeavouring to deny it, or even in attempting to doubt it, we tacitly assume its validity."² "Reality is one in this sense that it has a positive nature exclusive of discord, a nature which must hold throughout everything that is to be real."³ "If we desire to glance in passing at the metaphysical side of the matter, we may remind ourselves that the real is individual, and the individual is harmonious and self-consistent. It does not fly apart, as it would, if its qualities were internally discrepant."⁴ "If we are, in the end, to attach any definite intelligible meaning to the distinction between things as they really are and things as they merely appear to be, we must clearly have some universal criterion or test by which the distinction may be made. This criterion must be, in the first place, infallible; that is, must be such that we cannot doubt its validity without falling into a contradiction in our thought; and in the next, it must be a characteristic belonging to all reality as such, and to nothing else. Thus our

² Bradley, *Appearance and Reality*, Bk. II, ch. xiii, pp. 136-7, 2nd ed. rev., 1906.

³ *Ibid.*, p. 140.

⁴ Bradley, *The Principles of Logic*, Bk. I, ch. v., 14, ed. 1883.

criterion must, in the technical language of logic, be the predicate of an exclusive proposition of which reality is the subject; we must be able to say, "Only the real possesses the quality or mark X." We have such a criterion in the principle that "what is real is not self-contradictory, and what is self-contradictory is not real."⁵ Freedom from contradiction is a characteristic which belongs to everything that is real and ultimately to nothing else, and we may therefore use it as our test or criterion of reality. "The Law of Contradiction simply confirms and reiterates that assumption of the unity of reality which the Law of Identity involved. Reality, the Law of Contradiction asserts, is a *consistent* unity; which is merely to say over again that it is a unity."⁶

These views are cited at some length simply to give point to the remarks that follow. They raise a number of specific questions. What is the utility of the principle of contradiction as a metaphysical starting-point? What is the relation between that principle and the conception of a whole? How far and in what sense is the principle of contradiction absolute and infallible? Is the principle in its nature and in the range of its validity conditioned by assumptions and ideas of commonsense and of science? Is the principle in some sense after all a principle of *human thought* and expressive of a limitation on the part of human beings and hence not possessed of that significance in relation to the universe which the theory in question supposes that it does possess? Are we justified in imposing *our* limitations upon the universe? These are some of the questions that arise and require to be kept in mind.

The utility of the principle as a criterion and a starting-point for metaphysics is questionable. The statement that

⁵ A. E. Taylor, *Elements of Metaphysics*, ch. 2, sect. i.

⁶ Bosanquet, *Logic*, II, p. 210.

reality is a unity or is non-contradictory expresses at most merely a very general and abstract condition which all propositions about the nature of reality must satisfy. It provides no clue to these propositions; they must be otherwise found. It comes to have significance and to be of utility when we have different propositions with which to deal. It provides a condition which will rule out some propositions and which will render others tenable. The term "logical," as in a quite old interpretation of it and as in the quotation from Bosanquet, means simply "consistent." But consistency in what? Consistency means adherence to and acceptance of all the implications of some admitted or denied propositions. Ultimately we come back upon the idea that "logical" means adherence to one's definitions and initial propositions, explicitly stated or merely assumed. Logic, however, can say nothing about the validity of these definitions and initial propositions, except in so far as to show that all are not equally primitive or are not all consistent. The principle of contradiction is not a principle from which fresh principles or propositions can be deduced. It is merely a selective principle. It only enables us to decide what we must retain or give up, *if* we accept one or two specific propositions, or what must follow on our definitions or assumptions.

We come to a second question. Is the principle of contradiction a sufficient basis on which it can be asserted that reality is a whole? What is the relation between the principle and the conception of a whole? Does the theory cited **above** actually argue from the principle to the fact (if it is a fact) that reality is a whole, or is the theory justified in using the principle at all only *if* reality is a whole? Is it the case that the only sound position must be thus stated: if reality is a whole, then the principle of contradiction can be validly used, and only so can it be used? The argument

that follows seeks to maintain that the principle of contradiction rests upon and gives expression to the idea of a whole and consequently cannot be used to establish the proposition that reality is a whole. The latter, if it is to be sustained, must rest on evidence of a nature different from the principle of contradiction. The theory under discussion is, accordingly, in using the principle as a metaphysical principle, assuming the point it claims to establish. The application of the principle to reality is valid only *if* certain conditions are fulfilled; and the principle is not capable of establishing whether these conditions are or are not fulfilled. One of these conditions is that reality is a whole.

This case provides one illustration of the way in which logical principles rest upon some more primitive conception and are seen not to be absolute, and are likewise seen to be possessed of no more infallibility than is possessed by that more primitive conception. There is a sense in which logic is to a great extent an affair of "mind," but it is not in the sense that logic is a science of thinking or reasoning understood as a subjective or psychological phenomenon, or in the sense that logical principles are principles expressive of thought and are prescribed by the latter for the objective world. Nor are the "demands of thought or reason" in any way to be regarded as criteria to which the objective world must conform or as clues to its nature; for they may arise merely out of assumptions never clearly formulated. The sense in which logic is an affair of mind is that it is an affair of meanings or definitions which we formulate or construct and to the implications of which we are tied down. Thus there is a sense in which the compelling force of logic lies in our own act, in our own initial premises or postulates.

Traditional logical theory has concerned itself ex-

clusively with propositions asserting qualities of a whole or asserting the inclusion of a part in a whole. It has taken the idea of whole and part or of whole and attribute as fundamental; and all the theory and its logical principles follow from this initial basis. It has assumed that there are wholes concerning which assertions, and assertions of a certain kind, can be made. In fact, it has implied that assertions can be made only if there are wholes or complexes of qualities. Given that there are wholes understood in a certain sense, that is, to have certain properties and to be capable of certain relations, logical theory can formulate its principles, for the latter are based on the idea of these properties and relations. In this respect logic is in a position similar to every other science. Logical principles rest on an initial postulate. The recognition of this fact makes it clear why so much difficulty has been experienced in giving any definite formulation of logical principles such as Identity and Contradiction, and it also makes it clear in what sense these principles are self-evident, necessary, and certain. They are fundamental principles of logic because they express the nature of the primary conception of logic, namely that of a whole of a certain kind capable of certain relations. They are self-evident, independent, and incapable of proof for the same reason. All the defects, as well as the merits, of logical theory have their source in the initial postulate.

What has been said raises the question whether or in what sense logic, as has been frequently held, possesses a status superior to that of the special sciences and is in a position to prescribe laws to them. The basal conception of logic—that of a whole of a certain kind capable of certain relations—is not something innate or a priori. It is a conception derived from experience by a process of refinement; it is derived from experience of specific concrete

wholes; and the beginning of logical theory historically depended in the first instance upon the elaboration of a conception of a whole in the abstract. The difference between logic and the special sciences is merely one of generality; the special sciences deal with specific concrete wholes or entities, while logic deals with wholes in the abstract and with very general properties of the more specific and concrete relations with which the sciences deal. The validity of logic is accordingly not greater than that of the special sciences. Presumably, if the special sciences gave up the idea that they were dealing with wholes and relations between wholes, logic would find itself compelled to adopt a new basal conception. Presumably also it would be driven to that not directly and immediately but by discovering that its logical principles, based on the conception of a whole, found no significant confirmation in scientific knowledge. Logic would thus seem to be always limited or conditioned by scientific knowledge or by what science says about the universe. Logic, based on a conception that is not fundamental in human knowledge, can hardly claim to be itself authoritative over science or to be fundamental.

The conception of a whole on which logic has been based and which finds its justification in the views of commonsense and to a certain extent in the conceptions of traditional science, is a whole which forms the subject of a proposition and of which qualities are predicated or which is asserted to be a part of a larger whole. The principle of contradiction derives its significance and its applicability from this conception. To interpret the principle and to apply it, a whole is held to have a definite and positive nature; in consequence, only certain qualities can be together qualities of it, while certain other qualities are excluded. The latter qualities, however, in virtue of the assumption about a whole, must be attached to some other

whole or wholes other than that from which they are excluded. This is a condition essential to the intelligibility and applicability of the principle. This is the sense in which the doctrine that all contradiction involves a reference to a whole is valid. But in this sense the principle of contradiction reposes on the empirical fact, established by scientific investigation, that certain qualities are compatible and others incompatible with reference to a specific whole. Logic must simply accept the fact of compatibility and incompatibility as testified by scientific knowledge. Logic has not the ability to decide whether that fact is really ultimate or not. Logic thus reposes upon a scientific view of matter and its properties. What science means by compatibility and incompatibility is for science to say. There is reason to believe that any definition will involve conceptions of time and space. Accordingly, the conception of a whole and hence the principle of contradiction rest upon conceptions of matter and of time and space, and will possess no more absoluteness than do these.

Thus the principle of contradiction is neither absolute nor infallible. It is conditioned by the conception of a whole which is fundamental to logic. It is not infallible, for that conception of a whole presupposes views of matter, time, and space which cannot claim infallibility. It cannot, therefore, be with certainty considered as an absolute and infallible criterion of the nature of reality. Even, however, if it is accepted, it is quite incapable of proving that reality is a whole. For, in the first place, it rests upon the conception of a whole. But, in the second place, the conditions under which it is applicable would render it inapplicable to reality, if reality were a whole. The metaphysical theory which holds that reality is a whole and that the evidence for it is the principle of contradiction falls into confusion regarding the conception of a whole

as the basis of logic. The proposition that the conception of a whole is the basis of logic is not the same as the proposition that there is only one whole and that logic rests upon a conception of *the* whole. The significance and applicability of the principle of contradiction rest upon a conception of a whole and of relations between such wholes. If there is only one whole, the principle in its logical sense is not applicable. In order to be able to apply it and to defend its being applied, it is necessary to interpret the proposition that "all contradiction involves a reference to a whole" as the proposition that "all contradiction takes place within a whole." This proposition does not express the relation which holds in logical theory between a whole and contradiction. Nor is it true, for a whole rejects contradictions, and the metaphysical theory in question makes it do so. Hence, also, it further follows that the argument that all finite wholes are incomplete and contradictory, and because of this incompleteness and contradiction point to an all-inclusive whole, is invalid. The principle of contradiction cannot prove the incompleteness and contradictoriness of finite wholes. Their incompleteness and contradictoriness are asserted on the basis of an *assumption* that there is an all-inclusive whole. Thus at every point it turns out that the metaphysical theory assumes the conception of an all-inclusive whole; and, because in logical theory the idea of a whole and the principle of contradiction are closely connected, it proceeds, though without clearly analyzing that connection, to assert that the principle of contradiction is an absolute principle which expresses the general character of this all-inclusive whole.

Attention has already been drawn to the fact that great difficulty has been experienced in interpreting and formulating in an intelligible manner the principle of contradiction as well as the other laws of thought. There ought not

to be this difficulty if the principle is self-evident. The difficulty is due to the fact that the principle is not self-evident; for it involves ideas that are very obscure and complicated. There has been some controversy as to whether in the formulation of the principle an explicit reference to time is necessary.⁷ Whether such a reference should or should not enter into the formulation does not affect the fact that the idea of contradiction involves ideas of time and place. But if so, it is still necessary to understand what is meant; and it is thus necessary to consider the ideas it involves. There is no contradiction in supposing that an object may have two distinct colours at different times. The possibility that two qualities, say two colours, become contradictories lies not in their being different but in sameness of reference, or in their being asserted of or in their claiming to be predicates of the same object at the same time. The idea of contradiction, as has been already noticed, involves the ideas of space and time; and any interpretation of the principle must be bound up with theories about the nature of time and space. This is a point to be borne in mind, because the metaphysical theory under examination, in virtue of the application of the principle of contradiction, reduces space and time to *appearance*. The theory is thus itself inconsistent, for it cuts the ground from under the principle on which it rears its structure.

Another important point must be noticed. The qualities of *different* senses can never possibly become contradictories. A tactile quality, such as hardness, can never become a contradictory to a visual quality, such as red. They can never be incompatible. This means that contradiction rests on the complicated fact that two or more members of the same series cannot occupy the same space at the same

⁷ See Ueberweg, *Logic*, pp. 436-7.

time. The possibility of contradiction lies in the nature of the members of the same series; while non-contradiction lies in the nature of the members of different series. This fact has an interesting relevance to the applicability of the principle of contradiction to reality and to the conclusions which may be drawn from such an application. There is an ambiguity in the idea of contradiction and of non-contradiction which has not been generally noticed. That idea has usually been considered as being applicable in one unambiguous sense both to the members of the self-same series and to the members of different series. When contradiction, however, is traced to its roots, the sense in which two visual qualities are non-contradictory is not the sense in which a visual quality and a tactile quality are non-contradictory. In the one case, contradiction means that an object A cannot have the quality red and also the quality blue together, and non-contradiction means that the quality red qualifies the object A while the quality blue qualifies some other object B, two objects being thus involved. In the other case, contradiction cannot occur; and non-contradiction means that an object A can have the quality red and the quality hard together, one object only being involved. The second case is just that where the idea of contradiction has no significance and is not applicable, for there is lacking in it something which renders contradiction possible. The principle of contradiction is thus not of universal validity and capable of universal application, any more than the idea of husband is validly applicable to every human being. It is accordingly not capable of giving a clue to the nature of reality in all its range; and there is no reason, therefore, to suppose that reality is that kind of compact whole which the metaphysical theory of Bradley and Bosanquet, on the basis of the principle of contradiction, maintains it to be.

The question arises as to what is that something which is present in a specific series, for instance of visual qualities, and which constitutes a basis for possible contradiction, while it seems to be lacking between different series and its absence gives another significance to non-contradiction. A consideration of this question leads to an examination of certain ideas which appear in the formulation or else in the interpretation of the principle of contradiction. An object cannot both have a quality X and not have it at the same time, or it cannot have X and non-X at the same time. This means that the principle of contradiction involves the idea of sameness—there must be the *same* object, there must be the *same* time, or there must be *sameness* of reference.

Now it is becoming well-known that these conceptions are full of difficulty; and the fact that there is such difficulty shows quite definitely that the principle of contradiction is far from being axiomatic. The only ground for its being regarded as axiomatic has been that the idea of sameness was thought to be simple and straightforward; and this belief has rested upon certain assumptions regarding space and time. These assumptions are expressed in the conception of the unity of space and the unity of time and in the idea of a public space and a public time. On the basis of such assumptions no difficulty has been felt to be present in the idea of *sameness of place* or in the idea of the *place* where an object is. *Sameness of time*, it has been felt, is a very simple matter to decide; all that is required is to take a reading on a clock or watch and to compare readings on different watches or clocks or by some other means to fix the date of an occurrence. All this is a matter of an age-long science that has become the substantial body of commonsense.

To question the validity of this attitude may seem very foolish. But it is science, the steady destroyer of common-sense, that finds it necessary to question it. For all practical purposes the commonsense view may continue to be satisfactory; but it is incumbent on the philosopher to ask what this means and implies. It is important to do so because these controversial conceptions enter into the meaning of contradiction; and the point at issue is the applicability of the principle of contradiction to the universe or reality. Is there any reason to suppose that what is satisfactory for all practical purposes is also satisfactory for the interpretation of the universe? Is there any justification for limiting the nature of the universe by the requirements of human purposes? What then is implied by *all practical purposes*?

From the purely scientific point of view it means that the difference between the results attained on the basis of these conceptions and the results attained on the basis of more adequate conceptions is so small as to be negligible. But this negligibility is not with regard to the universe but holds only in reference to a part of the universe relatively to which these conceptions remain valid and where the conditions give support to a common point of view. This consideration, however, shows how propositions are relative to a certain point of view. So long as investigators are carrying on their work under similar physical conditions, no factor enters to produce fundamentally different results. The importance of this appears on the side of social life. It is obvious that in social affairs it would be extremely inconvenient if the time, distance, and calculations of the policeman varied from those of a driver of a motor car moving at a great speed.⁸ Such a difficulty would not arise

⁸ Cf. W. P. Montague, "The Einstein Theory and a Possible Alternative," *Philosophical Review*, March, 1924, pp. 152 ff.

so long as rates of speed did not become greater than they are at present; but if they were increasing much, as seems possible, the inherent difficulties of time and space measurements would be acutely revealed. They would reveal that there is no absolute time or space but that the measurements of time and space are merely conventional. Time- and space-measurers are not absolutely neutral; their neutrality is conditioned. The significance of all this is that the conceptions of time and space have been accepted as valid because their application has fitted into the co-operative activities of men, and they have done so for the reason that those who are interested in the matter have been living under physical conditions affecting all alike. Social life itself has acted as a spur to the securing of neutral measurers and common standards wherever necessary in order to effect an harmonious working of communal life. The social factor helps the development and the formulation of the idea of a public space and a public time so that times and places may be the same for all.⁹

Hence the principle of contradiction is not a demand of the reason. Its force does not lie in the rational nature of man. It rests upon the need of securing co-operation in social life. This need is in part satisfied by the fact that physical conditions are such as to facilitate and support a common point of view, and that these conditions reveal no fundamental divergence in men's interpretations of things. The need is also further satisfied by the elaboration of neutral instruments for making and recording observations. The question now, in the light of this, is whether there is any reason to suppose that what is satisfactory from this point of view common to men living under certain conditions and elaborating conventions suitable within

⁹ Cf. A. E. Taylor, *Elements of Metaphysics*, p. 246, on the social nature of the conceptions of space and time.

the area of their life, is metaphysically adequate to reality. Is there any reason to suppose that their point of view is a point of view valid for the universe? Is there indeed any reason to suppose that, even if it is admitted that the traditional point of view is valid in a limited way, there is possible *one* point of view that is absolute or true for the universe? The belief in the past has been that the point of view of traditional science and of commonsense was absolute and that its implied propositions were valid for the universe; hence it has been held that logical principles, such as that of contradiction, were valid not merely for a specific and human point of view but were valid for reality absolutely.

What requires examination is the foundation for any such belief. To carry this out it is necessary to keep the immediate issue in mind. The metaphysical theory of absolutism asserts that the principle of contradiction is an absolute criterion; it is a criterion of reality absolutely. On the strength of this it proceeds to assert that the propositions formulated with regard to any finite sphere are contradictory, and that there is only *one* point of view for which there is no contradiction. Space and time on this theory are conceptions valid for a limited point of view but for that reason are contradictory. At first sight modern science, by pointing out the inadequacy of the conceptions of space, time, and matter, would seem to give support to this view. But it is only at first sight. Modern science refuses to accept the idea of an absolute point of view. There are points of view, each being defined by certain postulates. The conception of a whole, which has already been shown to lie at the basis of the principle of contradiction and to give significance to it, now appears as a point of view. But if more than one point of view is

possible and if there is no one that has a right to be called *the* point of view, two propositions that are seemingly contradictory may yet be true. A contemporary scientist can write: "it can scarcely be said to be a self-contradictory property to be in two places at the same time any more than for an object to be at two times in the same place."¹⁰ The reason is that what are called place and date are dependent on certain factors, such as the axes of reference and the speed of light. The principle of contradiction is thus seen to express the coherency of propositions relative to a point of view. It is a principle of selection and rejection of propositions relative to a point of view; it is not a principle applicable to the relation between two propositions belonging to two different points of view and is not capable of selecting or rejecting either of them, just as it is not applicable to any relation between, say, a colour series and a tactile series.

Nor is the principle of contradiction capable of selecting between different points of view and decreeing that one is the right point of view. It is incapable of deciding between the sets of postulates that go to define the various points of view. The scientist has devised formulae for interpreting results attained by reference to one point of view in terms of another point of view. What becomes fundamental is thus a law of transformation, and not the law of contradiction. The idea of co-ordination and mutual compatibility takes the place of contradiction and mutual incompatibility. The co-ordination of points of view becomes the substitute of Bradley's absolute in which all contradictions are *somehow* reconciled. The unity of the universe is not a unity that is capable of being properly expressed in the form of the principle of contradiction,

¹⁰ Eddington, *Space, Time, and Gravitation*, p. 60.

but it is of a purely formal character. There is no absolute point of view in reference to which the nature of the universe can be or is to be interpreted. The metaphysical theory of absolutism is right in emphasizing the limited nature of any point of view and the consequent relative character of propositions or of knowledge, but it is wrong in using this fact as evidence for asserting that there is an absolute point of view. And its paradoxes and its difficulties are due to its making absolute a principle which is itself valid only in reference to a finite point of view.

What the metaphysical theory of absolutism has unwittingly done in accepting the principle of contradiction as a proposition valid throughout all reality is to regard as absolute certain conceptions which are only valid relatively to a special point of view. If its contention is sound, the conception of sameness—sameness of time, sameness of place, sameness of object—must be absolute and have only one ultimate meaning. But there is no such absolute meaning to be attributed to that conception. "A perceptual object," says Dr. Broad, "is really not one single homogeneous object, present in a place in the movement-continuum in one single sense of 'presence.' It is a number of inter-connected objects of different types, and the different kinds of objects included in it are present in different senses in the place where the perceptual object is said to be."¹¹ Each visual sensum is literally present only at a place in its own visual field; each tactual sensum is literally present only in its own tactual sense-field. When we say that visual sensa and tactual sensa alike are at the same place, we are using "place" in a sense that is defined only by bodily movement. "There is one and only one kind of place which we deal with when once we leave indi-

¹¹ *Scientific Thought*, p. 330; cf. also p. 345.

vidual sensa and their fields and pass to physical objects in the widest sense of the term. This is a place in the continuum of possible positions of our bodies as we move. . . . Wherever we talk of any sensum occupying a place in the movement-continuum we are using terms in a Pickwickian manner and are bound to define them."¹² There is no clear and unambiguous meaning of "place."

There is a corresponding difficulty with regard to the conception of time. Sameness of time is thought to be an easy matter to decide; all that is necessary is to consult a time-measurer such as a clock. Though this procedure is familiar and has become habitual, it rests upon conventions involving complicated conceptions. It rests upon the idea that time is homogeneous and is something distinct from space and matter. It involves the idea of simultaneity and a distinction, necessitated by the fact of the speed of light, between sensible simultaneity and physical simultaneity. Behind it is the traditional view "that there is only one permissible time-direction, which can and must be used for *dating all physical phenomena.*"¹³ But this view, though of actual utility, need not be any longer accepted. There is nothing that can be called *the* timeless space of nature. More directions than one (though not all) in physical space-time are permissible time-directions; and there is no reason for holding that two events which are simultaneous in one frame of reference will be or must be simultaneous in another frame of reference, or that two events that are in the same place in the timeless space of one frame will be or must be in the same place in the timeless space of another frame.¹⁴

¹² *Ibid.*, p. 333.

¹³ *Op. cit.*, p. 475.

¹⁴ *Ibid.*, pp. 475 ff.

It would seem therefore that the metaphysical theory of absolutism has been assuming that there is an absolute *sameness*, and that it has been applying in the metaphysical sphere that idea of absoluteness which was at one time influential in science. The decay of absolutisms everywhere involves an absolute metaphysics in their fall. The conception of sameness can be given, though there is difficulty and it is not a simple matter, a meaning by reference to a point of view. This is the unity to which the principle of contradiction is supposed to point. The conditions under which the principle is applicable show that it is not a principle applicable to reality. There is no possible way of giving a meaning, from the side of reality in its whole range, to the term "sameness." There is no evidence that reality is an object in the sense in which the principle of contradiction in its ordinary logical usage involves an object; and even if it were such an object, any interpretation would still be subject to the difficulties which have been seen to exist in the case of an object. An examination of the conception of a perceptual object shows that the principle of contradiction comes down to a question of a relation between *sensa* of a specific series, such as visual *sensa* or tactile *sensa*; but then spatial relations in a clear straightforward meaning do not hold between the different *sensa* of different senses; nor, as has been seen, does the principle of contradiction so hold. The meaning of "sameness" leads back, accordingly, to a problem about *sensa* and about the way in which they constitute an object and in which an object can be the "same" in different places and at different times.

The metaphysical theory of the whole or of absolutism lays great emphasis upon "unity." The preceding sections represent an attempt to show in what sense "unity" is in-

volved in the conception of contradiction. The "unity" is a point of view defined by a set of postulates; and within this reference all propositions are coherent and the universe is interpreted so as to obtain a set of propositions that are coherent. But the metaphysical theory asserts and seeks to defend the proposition that the "unity" is a system. Now the preceding examination of the principle of contradiction has shown that the latter is not a sufficient basis for this conception of system. "Systematic" is not synonymous with "non-contradictory." The geometry of Euclid is systematic and non-contradictory. The entities discussed have certain relations to each other; and these relations have logical properties in virtue of which deductions can be made and certain propositions accepted and others rejected. All the propositions hang together in accordance with definitely apprehended and intelligible relations. The emphasis, in the conception of system, is upon the relational factors. A perceptual object will, on this view, fail to comply with the conception of system. There is no clear intelligible relation, possessing certain logical properties, between the visual qualities, the tactile qualities, and so on. Yet there is a sense in which a perceptual object is non-contradictory; it is non-contradictory, as has been seen, because the conception of contradiction is not capable of application to it at all.

The metaphysical theory has maintained the systematic character of reality as a whole in the first sense of system. That would mean that no two constituent propositions of the system could be contradictory. As, in the conception of system, the emphasis is upon the relational factor, to say that A has the relation X to B and that A has the relation Y to C or even the relation X to C would not involve a contradiction; nor would there be a contradiction between

the proposition "A has the relation X to B" and the proposition "A has the relation Y to B." In order to have contradiction, two relations of the same kind must be asserted to exist between A and B, such as two spatial relations or two time relations, so that the relation must be one or the other. Now modern science is prepared to admit that A, a constituent of the universe, may be related to B spatially or temporally in two or more different ways. A in one respect may be before B, in another respect it may be simultaneous with B. There is no reason, therefore, to admit that reality is a system in the sense maintained. Science would not admit that there is a proposition which can assert *the* real or true relation. As the conceptions of space and time are so much involved in the conception of contradiction, there may be a deep and subtle motive in the attempt to prove the *apparent* character of space and time. But if space and time are apparent or unreal and thus not to be regarded as inherent in the absolute, the principle of contradiction must also cease to be a principle of the absolute.

There is, however, the second meaning of non-contradictory according to which reality or the universe may be regarded as non-contradictory without being regarded as a rigid logical system. The analogy here is that of a perceptual object which is constituted of a series of sense of different senses. Just as, in order to give meaning to the term object, the different sense-strands have to be collected by some device or to be correlated, so the universe may be considered as having different strands which by a scientific device are or can be correlated so as to give us some conception of the universe. The visual qualities do not logically imply, as the English empiricists so often pointed out, the other sense-qualities; nor does one strand

of reality need to be considered as logically implying the others. They are not bridged by spatial relations or by any type of relation having logical properties. Relatively to the idea of logical connection a certain amount of looseness or of discontinuity may be characteristic of reality, and there may not be that unity for which the metaphysical theory of absolutism argues.

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AN EXAMINATION OF HUME'S THEORY OF RELATIONS

HUME'S philosophy has been aptly described as "naturalism," inasmuch as the determining factor in his thinking was the attempt to substitute instinct and belief or feeling for reason in accounting for the facts of human experience. One of his chief aims was to show that, except with reference to such relations as those upon which mathematical science is based, belief never rests on rational grounds, that the syntheses of reason are merely generalised beliefs. For instance, the assumption of permanent and identical things is a "natural belief" occasioned by the instincts or propensities of our human nature. The "plain man" takes his perceptions to be the real things; and, accordingly, conceives of them as continuing to exist when unperceived, and as remaining identically the same even though they have undergone change. Yet, in the case of visual perceptions, he has only to close his eyes in order to annihilate these perceptions; and since, on opening his eyes again, the perceptions he has are new perceptions, separated by an interval from the previous ones, to say that simply on account of their resemblance to the latter they are identical with them is manifestly unjustifiable. The identification of perceptions with real things is an "illusion," due to the mind's propensity to feign; but the belief in the existence of external objects thus engendered turns out to be *practically suc-*

cessful in the ordinary affairs of life, although theoretically it can neither be proved nor disproved. So, again, with reference to the self, the existence of a permanent and identical entity cannot be rationally established. Far from the self being a simple substance, and the most certain existent of which we are cognisant (as the Cartesians held), it evinces itself, from the standpoint of reason, as merely a multiplicity of *discreet* experiences. But we instinctively *believe* in its permanence and identity; and this belief *works successfully* in all matters of practical life. It is, however, as little capable of being theoretically proved as of being theoretically disproved.

It was certainly unfortunate that T. H. Green, in his examination of Hume's philosophy, ignored this doctrine of belief. But that the doctrine is beset with insurmountable difficulties there can be no question. It virtually assumes the very distinction between the conscious subject and its states which it is postulated to avoid, and which would undermine Hume's fundamental position that the sole constituents of experience are isolated perceptions. In trying to discover the nature of belief, he was compelled to suppose that it was either an "impression" or "idea," or a quality of "impressions" and "ideas." The former alternative was precluded, seeing that two persons might have similar ideas in their minds and yet entertain very different beliefs concerning them. It must, therefore, be some quality of "impressions" or "ideas." And the only way in which similar "impressions" or "ideas" can differ from one another qualitatively, is, according to Hume, in respect to the "force" or "vividness" with which they are endowed, so that we may be said to believe a proposition when our ideas are forceful or vivid, and to disbelieve it when they are faint and weak. Now, in the first place, it is impossible to understand the mean-

ing of the terms "force" and "liveliness" as applied to ideas, unless by the term "idea" be meant an "image," which was no doubt what Hume did mean. "Ideas," however, in the sense in which in this context they are relevant, are certainly not "images," and on that account alone the theory cannot stand. And, in the second place, even if we could assign a meaning to the phrase "the vividness of ideas," we should have the hopeless task on our hands of showing how differences in respect of this one quality can be used as the basis of a number of important distinctions. The differences between perception and imagination, between memory and imagination, between belief and doubt are all, according to Hume, due to differences in the liveliness and force of our ideas. Suppose that I (a) remember an isosceles triangle which I drew yesterday, (b) believe that the two angles at the base of an isosceles triangle are equal to one another, (c) imagine an isosceles triangle. How exactly could these processes be distinguished on the view we are considering?¹ In the third place, it is clear that Hume was himself wholly unable to work out this view of belief without calling to his aid, if not in name yet in fact, the mental process which Locke had variously designated as that of combining, distinguishing, abstracting and judging. Now whenever Hume finds it impossible to recognise in an "idea" the mere copy of some original impression, he introduces the qualifying phrase "manner of conceiving." Thus, for example, we have an *idea of necessary connexion* when we assert that one thing is the cause of another. This idea, Hume avers, is the repro-

¹ Similar difficulties present themselves in any theory of belief as a quality of ideas. And any theory which tries to reduce the mind to a 'bundle of perceptions' is forced to such a theory of belief. For example, Mr. Bertrand Russell (in his *Analysis of Mind*) takes the mind to be a complex of *sensa* and images and interprets belief as a *feeling* which *accompanies* certain of these *sensa* and images.

duction of an impression which the mind *feels* itself compelled to "conceive in a particular manner." Yes; but it is the *mind*—not the collection of discrete contents which is all, Hume insists, we are justified in taking the mind to be—that conceives, or, in other words discriminates and judges; and, unless the two ideas of a particular cause and a particular effect can be held together in one act of apprehension and thus be thought of in connexion, it would be simply inexplicable how this "manner of conceiving" could come about. Now, it may be said in Hume's defence that he admits the inexplicability. In the present context, that is hardly, I think, true. In any case, however, he does allow that we *have* the idea of necessary connexion—an idea, that is to say, which, whether "fictitious" or not, involves the apprehension of two terms in their togetherness and mutual relation. How, then, can it possibly be maintained that we certainly know of *all* "perceptions" that they are "separate and distinct," when, even from the point of view of empirical observation, we certainly know that *some* ideas are not.

So far as the distinction between "natural" and "philosophical" relations is concerned, Hume includes under the former the three relations of resemblance, contiguity and causation, while under the latter he includes the seven relations of resemblance, identity, spatial and temporal relations, relations of quantity and number, relations of degree, contrariety, and causation. Obviously these cannot be regarded as two divisions of the same class, because, as Meinong remarks, the genus common to both is wanting. Nor can the way in which these two kinds of relation (if one may use this inexact expression) stand to one another be that of mutual exclusion, seeing that, for example, causation belongs to both lists, contiguity and

resemblance would seem as a matter of fact to be both philosophical and natural relations, though not necessarily to subsist together, while there are some philosophical relations (such as distance²) which seem to preclude the presence of natural ones. In the long run, it is, however, only "natural" relations that Hume will admit to be true relations. And with these he couples the view that, by virtue of variations in them, the "imagination" (which is, as Pringle-Pattison observes, a "hardly veiled reintroduction" of the conscious self) may determine to group ideas together in particular ways. Association of ideas is, then, the substitute that Hume has to offer for the synthesis that would appear to be essential to knowledge, and it is by the principles of association that he endeavors to explain what are otherwise called judgments of relation. The attempt turns out to be a failure, as Hume himself candidly acknowledges in the Appendix to the *Treatise*. The only combination which, by any show of plausibility, could be accounted for in this manner would be the formation of complex ideas out of simple constituents. But the idea of a relation between two known contents is not rightly to be described as a complex idea;³ and, as there is no impression from which it could have been derived, Hume was finally obliged to recognise that the association theory of its origin breaks down. Throughout his attempt to employ the theory in this context one can discern a perpetual see-saw between two conflicting methods. On the one hand, association is treated by him as that which gives rise to ideas of relation, and, on the

² "In a common way," Hume remarks, "we say that 'nothing can be more distant than such or such things from each other'."

³ Inconsistently enough Locke had described 'ideas of relation' as complex, and he did so because they involved, in each case, a plurality of compared ideas. But this is obviously no reason for supposing that the 'idea of relation' is itself complex; and, indeed, at other times, Locke speaks of such 'ideas of relation' as succession and power as simple.

other hand, ideas of relation are treated by him as the features that give rise to association.

The inherent contradictions involved in Hume's treatment will be best brought out by considering the way in which he handles certain of the relations that he enumerates.

(a) The relation of *resemblance* is said to be necessary to relation of any kind, although, as Meinong urges, it would be hard to show how it is involved in such a relation as that of cause and effect. But the fundamental difficulty in Hume's account of resemblance is this. He informs us, on the one hand, that such a perceived object as a "globe" contains many different resemblances and relations, and, on the other hand, that it consists in "the impression of a white colour disposed in a certain form." Now, however gladly one would accept from Hume acknowledgment of the fact that the content perceived is not, in such a case at least, a simple unit, however readily one would recognise his acknowledgment that "resemblances and relations" are comprised within this content, yet the acknowledgment must be pronounced to be wholly irreconcilable with his general view. If, in the case cited, the "globe" is an "impression," and if "relations" are "ideas," how *can* the former contain "different resemblances and relations?" An *idea* of resemblance can, as Hume is reluctantly compelled to admit, only arise through an act of comparison, by which various "impressions" are found to be partly identical and partly different. If, then, we have the "impression" of a "globe," that must imply that we have previously gone through a process in which various objects have been perceived and discovered to resemble one another, which means, in other words, that the "idea of resemblance," so far from being just a

"related idea," is the product of an act of judgment. An idea qualified by relation of resemblance to other ideas is, in short, a very different thing from an idea of resemblance—different, as Green puts it, with all the difference which Hume ignores between sense and thought. If it be urged that, in the case of the complex content just referred to, we first apprehend directly its various features, and *afterwards* discern that these resemble the features of other complex contents we have had before us, then the reply is that by such a contention the difficulty is only thrown a stage further back. If the content now before my mind has various features, these must be distinguished from one another, and the act of discriminating is identical in character with that by which one content is found to resemble another.

(b) Following a distinction which Hume himself does not make, but which is now sufficiently familiar, we may speak of the formal and real relations involved in conscious experience. Under the former are included spatial and temporal relations, which are universal elements in our experience. The discussion of them is opened by Hume with the consideration of a specific problem, the problem, namely, as to whether space and time are, as the mathematicians supposed, infinitely divisible. In conformity with his general view, Hume was bound to maintain that they are not, that such infinite divisibility is a fiction. He persists in regarding the ultimate elements of experience as discrete units, capable of being represented in isolation as ideas. In what orders or classes of impressions are, then, the units of space and time to be found? Hume's answer, when freed from much ambiguous phraseology, is briefly this. Certain impressions, those, namely, of sight and touch, have in themselves the characteristic of extension, because these impressions (in

this context Hume speaks of them as "points") exhibit a certain order or mode of arrangement—which order or mode of arrangement is common to both coloured points and tangible points and which considered separately is the impression from which our idea of space is taken. And so, too, in respect of time. All our impressions and ideas are received in a certain order, the order of succession. This *order* is itself the impression from which the idea of time is derived. "The ideas of space and time are no separate or distinct ideas, but merely those of the manner or order in which objects exist."

After what has been already said, it is hardly necessary to emphasize the two-fold inconsistency here—first, in describing the *order* in which the impressions are arranged as itself an impression, and, secondly, in describing *coexistence* and *succession* as ingredients in an experience which actually consists of isolated units. On the one hand, the "points" which are said to be in a certain order must be *ex hypothesi* themselves impressions. If, then, *any* impression can be said to be one of "coloured (or tangible) points disposed in a certain manner," this can only mean that the impression in question is or consists of such "points." And, indeed, in one passage, Hume expressly describes extension as "a compound impression, consisting of parts or lesser impressions, that are indivisible to the eye or feeling, and may be called impressions of atoms or corpuscles, endowed with colour and solidity." Yet, unless these "lesser impressions" can be regarded as present together, they must follow one another, and thus precede the "compound impression." On the latter supposition, extension would consist of parts none of which could be present at the same time, and all of which must cease to be present before extension itself could come into being. But the former supposi-

tion is precluded by what Hume inculcates in regard to time. It is true he does not assert in so many words that all visual impressions must be successive, but he *does* assert that "the impressions of touch," which along with those of sight he had represented as constituting the "compound impression" of extension, "change every moment upon us." And after having made out extension to be a compound of coexistent impressions, he proceeds to speak of the idea of time as derived "from the succession of our perceptions of *every kind*, ideas as well as impressions." The parts of time cannot, he urges, be coexistent; and seeing that "time itself is nothing but different ideas and impressions succeeding each other," it would follow that "the parts of time" are those "perceptions of every kind" from which the idea of time is derived. If, then, *all* impressions, as parts of time, are successive, how can some impressions, as parts of space, be coexistent? On the other hand, not only does Hume fail to account for the awareness of coexistence, he equally fails to account for the awareness of succession. The bare perception of impression after impression, even supposing such perception were possible, would not of itself constitute such awareness. A succession of perceptions is one thing, a perception of succession is quite another, and from the former to the latter there is "no road." How could a sequence of impressions of which no two are present together, undetermined by relation to anything other than the impressions themselves, yield a consciousness of the relation between the moments in which the impressions are given, or of the sum of such moments? As Kant was presently to insist, no apprehension either of coexistence or succession is possible save in reference to a permanent over against which temporal changes can be recognised.

From his view of space and time there follows in Hume's *Treatise* the most extreme empiricism with respect to the nature of mathematical reasoning—an empiricism which does not, however, extend to the propositions of arithmetical and algebraical science. With respect to these, he apparently held that, since each element of conscious experience is presented as a unit, and since we are capable of considering any complication of facts as a unit, our *manner of conceiving* is absolutely general and distinct, and that upon it there could be based a perfectly accurate and general science, that, namely, of discrete quantities. But in regard to geometrical science, since the data are facts of experience apprehended in a wholly empirical fashion, the results, which rest on comparisons themselves empirical, can never be more than approximates. Geometrical propositions imply an exactitude which does not correspond to actual knowledge. "Though it (i.e., geometry) much excels, both in universality and exactness, the loose judgments of the senses and imagination, yet it never attains a perfect precision and exactness."

Hume's account of mathematical relations, full, as it is, of obscurity and of irreconcilable statements, is in itself a sufficient refutation of his whole theory. From the well-known passage in the *Inquiry*, where the distinction is drawn between relations of ideas and matters of fact (§ iv. pt. 1), one would gather, as Kant did, that, according to him, mathematical propositions are all of them analytical, true on the ground that denial of them would amount to a violation of the law of contradiction. In reasoning on mathematical data, he appears to say, we may proceed by a mere contemplation of our ideas, because the ideas exactly correspond to the impressions, and mathematical propositions have, therefore, a truth

or falsity, independent of the concrete existence of the objects which may be implied in them. But, seeing that no more can be got from the "ideas" than is contained in the original impressions of which they are "copies," a *relation* between ideas must *either* be an actual occurrence, and then, according to Hume's own showing, its non-occurrence would involve no contradiction, *or* else "analytical," and in that case it would have to be restricted to the content of a single idea, which clearly it is not. And so again, with reference to the argument that, since each impression may be treated as a unit and independently of its concrete setting, the relations of number may be regarded as at once certain and universal, it is clear that Hume is here making use of a distinction between the process of numbering and the things numbered to which on his theory he was not entitled, and which is indeed totally inconsistent therewith.

But, as we have seen, Hume certainly did not regard all mathematical propositions as analytical; and with respect to geometrical relations he completely fails to account for the universality and necessity which admittedly they seem to possess. Even the fundamental idea of equality he took to be based on, and to be a copy of, the crude impression of "equivalence," of which we have no other standard than that of immediate observation. And when he comes to explain what is meant in geometry by a line, surface, or solid, his failure to do so is no less apparent. Each of these is, he avers, a complex of "coloured points," so that one line is equal in length to another if it comprises the same number of "points." But these "points" are so minute and so confused with one another that there is no possibility of counting them. It is, indeed, difficult to treat such a statement seriously. If a line be a collection of "coloured points," it can only be

made up of coloured surfaces lying side by side, and separated, therefore, from one another. How could these constitute a line, or even a continuous surface? Not only so. Each "coloured point," or surface, would be divisible into parts, and these again into smaller parts, and so on indefinitely. Consequently, we should never come upon a line at all. In short, the line of the mathematician is obviously not made up of "points" of this description; it is continuous, and any attempt to reduce it to discrete elements is destructive of its very nature.

(c) Coming now to what we have called real relations, relations between matters of fact, we have in them evidently reference to an existent conceived as independent of the momentary state of perceiving. Whenever we assert that something is or that it was or that it will be, our thought seems to connect what is immediately present with an existent distinguishable therefrom and independent of it. The typical example of such propositions is to be found in those that are concerned with events that occur. It is, then, upon the relation of cause and effect that all propositions concerning matters of fact ultimately turn.

The analysis which Hume offers of the supposed connexion of cause and effect is well known. The result reached by him amounts virtually to a complete reversal of our ordinary conceptions of the relation of one event with another. According to his view, there is no reason in the nature of things why any one event might not be followed by any other event, no reason, for example, why the rays of the sun should not freeze water instead of converting it into vapour, or why the north wind should not set the world on fire. We have no other guarantee that this will not happen than a subjective belief, engendered by custom; but for aught we can tell to the

contrary, what we call "natural laws" are merely statements of accidental conjunctions, of the fortuitous arrangements of natural circumstances, in which there is no necessity of order or connexion to be found.

This view has been so often effectively criticised that I can here confine myself to three considerations. In the first place, I think it evident that Hume is really assuming that very necessity of connexion for the appearance of which he is professing to account. For we are clearly entitled to ask how it comes about that our "perceptions" do succeed one another in the regular, invariable way, which he asserts they do, in order to give rise to the *belief* or *feeling* of their necessary connexion. Hume recognises amply enough that, even if such necessity of connexion be a fiction, the task is imposed upon us of explaining how the fiction is produced. And it is produced, he contends, by the circumstance of our having repeatedly experienced that certain definite "perceptions" invariably occur when certain other definite "perceptions" have preceded them. But, if our "perceptions" do, as a matter of fact, succeed one another in this regular, invariable way, does not such invariability of succession really imply that very fact of necessary connexion which was called in question? In fine, in trying to explain how the *illusion* of necessary connexion is engendered, Hume is virtually admitting that necessary connexion is already there. The necessity, he declares, is a subjective feeling, a habit of expectation, and this subjective feeling or habit of expectation is formed by the invariability of the succession of our perceptions. Yet, this invariability which gives rise to the feeling or habit in question is, in truth, only conceivable as the expression of just that systematic order and connexion in the nature of things, of which Hume could discover no evidence. In the second place, it has to

be noted that a merely constantly observed sequence is never of itself sufficient to establish the fact of causal connexion. If it were, the relation between day and night would have to be regarded as a relation of cause and effect, for night constantly follows day, and the expectation we have on the experience of day that night will follow is as strong as any expectation can be. Because two events have been frequently, or even invariably, conjoined in experience, to conclude, from that circumstance alone, that they are related causally is a characteristic fallacy, a fallacy which logicians have signalised as that of *post hoc, ergo propter hoc*. No doubt a constant conjunction of two events does afford a presumption that the relation between them is a causal relation, but it is never in itself sufficient to establish that there is a causal relation. Only a thorough analysis of the conditions can give us a right to assert causal relatedness. Furthermore, it is not true that it is only as a result of repeated observation that we feel ourselves entitled to assert a case of causal connectedness. The procedure of the chemist or the physicist shows that his conviction of the uniformity of sequence is irrespective of the number of instances in which it has been observed. A single instance in which one event has been followed by another is sufficient to establish the fact of such uniformity, if it has been ascertained precisely what it is that precedes and what it is that follows *in that instance*. The scientist proceeds on the principle that what is a fact once is a fact always. And a uniformity which can be established in this way is precisely what is implied in the term "necessary." The fact of such uniformity is not contingent upon its having been experienced by anybody or everybody. It does not come into being with the experiment that brings about our awareness of it. It is experienced because it is real; it is not real because it is

experienced. Indeed, in actual scientific investigation it is often the case that what is directly observed is disregarded, and a hidden connexion is, by the experiment, established, in which the causal relation is found and acknowledged, although it differs from the observed features of the sequence. For example, when hydrogen and oxygen are combined in the proportion of two to one, and water is found to result from the combination, that connexion is forthwith regarded as necessary, and, accordingly, as a causal connexion. Nevertheless, the antecedent in this case only manifests itself as an antecedent when the experiment has been performed which produces the effect. It is obvious, therefore, that frequency of sequence has here nothing to do with engendering the belief in question. In the third place, I would call in question the assumption which lies at the root of Hume's whole theory of causation. So far from its being true that, as he asserts, there is nothing in any object considered in itself that can afford us a reason for drawing a conclusion beyond it, exactly the opposite thesis might be laid down and defended. A conscious mind, it might reasonably be agreed, is capable of recognising any object or event in itself; every object or event carries us inevitably beyond itself, and constrains us to recognise its connectedness with other objects or events. Without such recognition of connexion, apprehension of an object or of an event would be impossible. Causal connectedness can, then, never be resolved into mere conjunction or succession. No doubt, considered as an event, the effect may be looked upon as, in a sense, "distinct from" its cause. The point is, however, that it never is *merely* an event. To treat it merely as an event is to treat it as a mere particularity—that is to say, as a mere characterless unit. No effect is merely an event of that sort; it is

always an event possessed of qualities, an event of such and such a character. And this means that it is the same universal feature which is present in both cause and effect, and which unites them together as elements in a single whole. So far from its being true that "we are never able to discover any quality which binds the effect to the cause," it may be said that it is *precisely* the *same* quality which is present in the two particular events, and which constitutes their intelligibility.

That Hume was aware of the inherent impossibility of the task at which he had been labouring is apparent from his Appendix to the *Treatise*. "There are two principles," he says, "which I cannot render consistent; nor is it in my power to renounce either of them, namely, *that all our distinct perceptions are distinct existences, and that the mind never perceives any real connexion among distinct existences.* Did our perceptions either inhere in something simple and individual, or did the mind perceive some real connexion among them, there would be no difficulty in the case. For my part, I must plead the privilege of a sceptic, and confess that this difficulty is too hard for my understanding." With remarkable discernment and subtlety, Hume thus hits upon the essential weakness of the view of experience which he had himself propounded. He had done all that it is possible to do in the attempt to manufacture knowledge out of isolated mental states. He had tried to look upon what is known as consisting merely of disconnected particulars, connected only by external relations. And in the long run he has to admit that experience so conceived turns out to be as a rope of sand, that no ingenuity would avail to introduce coherence into elements defined from the outset as incoherents, or to bring into relation elements that had all along been regarded as relationless. I think

the value of Hume's philosophy largely consists in the thoroughness with which he endeavored to work out a thought which has always influenced philosophic speculation, a thought that had largely determined the theorising of Locke, but which had never previously been freed from extraneous considerations, and so had never been able to exhibit its real significance in regard to the conception of relations.

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F. H. BRADLEY ON IDEA AS IMAGE AND AS MEANING

IT often happens that success in a struggle bears with it a certain type of defeat. This is peculiarly true when the battle rages over principles and concepts, when ideas are the weapons and arguments the maneuvers. Something like this occurred in the revolt of British objective idealism against English associationism and empiricism. What I have in mind here is well illustrated in F. H. Bradley's forceful distinction between idea as image¹ or psychical state and idea as meaning. Such a distinction, especially when it becomes as fundamental as it is for Bradley, reveals an admission of failure on the part of the 'speculative idea' (*i. e.*, the concrete universal)² to account for the fact of irrelevance and brute particularity. Hence in Bradley's hands the conflict between the 'speculative' and the 'empirical'³ ideas does not issue in a complete victory for the former. Rather, both leave the battlefield victorious and vanquished—but also transformed. The 'speculative idea'

¹ We might as well note at the outset the ambiguity of the term "image." Generally Bradley uses it loosely to cover all mental states. But sometimes he uses it in the narrower psychological sense as meaning centrally stimulated states as against peripherally stimulated states, or revived copies as against original sense perceptions. Unless the context indicates otherwise, we may interpret Bradley as using image in the wider sense.

² The "speculative idea" may be defined, in Hegel's terminology, as "a systematic totality which is only one idea, of which the several elements are each implicitly the idea . . ." (*Encyclopedia of the Philosophical Sciences*, § 243, Wallace's translation). This means, of course, to deny that ideas can ultimately be irrelevant, disunited, or merely conjoined facts of experience.

³ By "empirical idea" I mean any object of thought as it is directly "had" by any human mind at any particular time.

has become a mutilated adjective, an abstract universal without a home in concrete fact. On the other hand, the 'empirical idea' still exists, but is reduced to a mental state, a mere psychological fact,⁴ a fleeting existent which *is*, but is meaningless, and is neither true nor false.

What I wish to show is that this result is disastrous to absolute idealism, on the one hand, and that it is intrinsically untenable, on the other. The latter point, however, I do not mean to imply follows directly from the former. Both follow from a common doctrine which I assume to be true: viz., that both system or relevance and brute togetherness or irrelevance are irreducible, inseparable features of all of our ideas.

My intention is to consider the two-fold nature of idea for Bradley, first as it is expressed in *The Principles of Logic*, and then as it appears in Bradley's later writings. My conclusion will be a critical evaluation of Bradley's position in this matter.

It might be valuable as an introduction to indicate how Bradley's point of view was anticipated, to some degree, by Lotze. Lotze was interested in the movement by which thought attempts to transform mere conjunction of ideas in experience into rational connection. We find at the very outset of his *Logic*⁵ an attempt to show how the logical concept is related to and develops out of psychical impressions, an attempt strikingly similar, in some ways, to that on the part of Bradley to develop meaning out of the image.

⁴ The difference, I take it, between a "mental state" or "process" of modern introspective psychology and the "idea" of the English associationists is that the former is the product of abstract, scientific analysis and classification; the latter is the total unitary experience of any common-sense thing or object. However, this distinction is not accurate if taken too strictly. For the introspective psychologist often talks as though his mental processes were the total experiences we actually have on various occasions (especially in the psychological laboratory), and the associationist is willing to take the results of analysis of our ideas as themselves ideas. Cf. E. B. Titchener, *A Text-book of Psychology*, pp. 105-106.

⁵ Cf. Bk. I, ch. i.

The first function of thought, Lotze tells us, is to objectify impressions, to convert them into ideas or logical building-stones. This it does by naming them, thus separating them, identifying them, and making them permanent and universal objects of reference. "As soon as we give the name of red or green to the different movements which waves of light produce through our eyes, we have separated something before unseparated, our sensitive act from the sensible matter to which it refers. This matter we now present to ourselves, no longer as a condition which we undergo, but as a something which has its being and its meaning in itself, and which continues to be what it is and to mean what it means whether we are conscious of it or not."⁶ This does not mean, Lotze warns us, that such ideas or objectified impressions can exist outside all thought, but only that they are valid objects of reference for anyone at any time. "The logical objectification, then, which the creation of a name implies, does not give an external reality to the matter named; the common world, in which others are expected to recognise what we point to, is, speaking generally, only the world of thought; what we do here is to ascribe to it the first trace of an existence of its own and an outward order which is the same for all thinking beings and independent of them. . . ."⁷

In the second operation of thought (which is really the same as the first, but viewed from a different side), we have the three factors of positing (*Setzung*), distinction, and comparison of the content of ideas (*i. e.*, of impressions as objectified). Thought, here, does not bring external forms and superimpose them upon the matter of impressions. Rather, it simply recognizes the facts, interprets the relations holding between the impressions themselves in terms of aspects of their content. Thus we have what

⁶ *Ibid.*, § 2 (Eng. tr., vol. i, p. 14).

⁷ *Ibid.*, § 3 (Eng. tr., vol. i, pp. 15-16).

Lotze calls the 'first universal.' It is not conceptual, rather it is sensuous and is merely accepted by thought. It occurs as a common element in different impressions, its variations in the different impressions being quantitative only. The 'second universal' is the concept proper. It is an abstracted structure of essential marks. These marks are themselves, of course, universals, but are universals of the 'first' sort.

Such, in brief outline, is the way Lotze passes from impressions to concepts. Bradley does not follow Lotze in detail, but in many ways he seems to view his problem in the same light. First, he apparently agrees with Lotze that logic must start with wholly specific mental states. Again, it must interpret universal meanings as somehow developing out of these. Finally, it must interpret this development in terms of the 'matter' or 'content' of the mental states; that is, their specific existence is to be dropped out of sight in order that thought may get hold of permanent, universal predicates.

It seems to me unquestionable that in *The Principles of Logic* we have a distinct dualism, an emphasized split between idea considered as mental presentation of fact, on the one hand, and as meaning, on the other.⁸ We are told repeatedly that the symbol or sign is not the symbolized and must not be confused with it, for the symbolized is distinctly something beyond, and the symbol, in referring to it, must point beyond itself and thereby lose its own individuality. And a mental fact is not as such a symbol. To be a psychical occurrence and to be a symbol are quite different things; apparently many of the former are not

⁸ In Bradley's first work, *Ethical Studies*, one of his arguments against the pleasure-pain theory is that pleasure and pain are mental states; hence they are merely subjective and specific, and for that reason can not be set up as universal and objective standards. This would seem to imply that mental states are wholly subjective and specific; but perhaps Bradley is here accepting his opponent's views simply *ad hoc*. See *op. cit.*, 2nd ed., pp. 94-97.

the latter. Hence we must sharply distinguish between the meaning of an idea and its existence. The meaning of an idea does not and can not exist. It is never a fact. The existence of an idea is never strictly either that idea's meaning or any meaning at all. And so we are presented with the following meaning of idea: as presented it never means, as meaning it is never presented. As meaning, idea is timeless and eternal; as presentation, it is always in flux. As meaning, it is always universal, in the sense of abstractly universal—exclusive of particularity and concrete detail; as presentation, it is always specific, particular, invested with its full quota of detail. As meaning, idea is adjectival; as presentation, it is substantive. As meaning, it is true or false; as presentation, it is brute fact which merely is.

Within idea as psychical presentation we are given a further distinction. It has content or quality, and it is an existence. These two, the 'what' and the 'that,' must be kept forever distinct. Now it is true that the content of a presentation or image is not as yet or as such meaning. But it can become meaning in the following way. If, instead of being taken in its concrete wholeness, abstraction of certain features of this content is made, if, further, this result of abstraction is fixed by the mind and, by the loss of concrete and detailed context, made universal, then we have meaning. Not all meaning need come this way—developing internally and by abstraction out of the content (as over against the existence) of a mental fact. For some meanings are, in source, quite external to that which acts as symbol or sign. And even when we have such an internally begotten meaning, we must remember that it is torn from all the detail and evanescence of its living context, and must, moreover, be stone dead—neither having

nor claiming any existence in the life of the stream of consciousness. Nevertheless Bradley insists that at least some meanings are simply mutilated abstractions from the content of images. Hence, though image and meaning are kept strictly distinct in Bradley's thought, yet we must accept the rather startling paradox that the universal meaning is nothing really other than the particular image—it is simply a mutilated part of the latter.

Such, in summary, is the effect of the impingement of the empirical idea upon the speculative idea, as revealed in *The Principles of Logic*. That is, the empirical idea loses its tacit meaningfulness and self-identity and becomes in earnest a mere particular—a mere, brute fact which never recurs. The speculative idea, on the other hand, tends to lose its concreteness; it is thrown back into a realm of abstract, adjectival, universal meaning. It may be true, it is always significant, but it can not exist. And though logical meaning is supposedly derived on occasion from psychical fact, still we are left wondering whether such a genesis is not more of a miracle than an indication of the fundamental unity of these two sorts of idea. Let us consider Bradley's own words.

"Every kind of fact must possess [the] two sides of existence and content. . . . But in anything that is a symbol we have also a third side, its signification, or that which it means."⁹ "A sign is any fact that has a meaning, and

⁹ *The Principles of Logic*. 2nd ed., vol. i, p. 3.

meaning consists of a part of the content (original or acquired¹⁰), cut off, fixed by the mind, and considered apart

¹⁰ Evidently Bradley uses the word "acquired" to cover the case where a sign stands "for that with which internally it is not connected, and with which it has been joined by arbitrary chance" (*ibid.*, vol. i, p. 4). It seems to me there is a real difficulty here for any interpretation that looks upon meaning as an abstraction from the given or presented, but Bradley passes it over as of no importance. Compare Stout's criticism below, pp. 613f.

It might not be amiss to note here that Bradley's view of sign and signified is not in harmony with Hegel's. For Hegel, the meaning is not simply a part of the content of the sign. "The sign is some immediate intuition, representing

from the existence of the sign."¹¹ Every idea "exists as a psychical fact, and with particular qualities and relations. It has its specialty as an event in my mind. It is a hard individual, so unique that it not only differs from all others, but even from itself at subsequent moments. And this character it must bear when confined to the two aspects of existence and content. But just so long as, and because, it keeps to this character, it is for logic no idea at all. It becomes one first when it begins to exist for the sake of its meaning. And its meaning, we may repeat, is a part of the content, used without regard to the rest, or the existence. I have the 'idea' of a horse, and that is a fact in my mind, existing in relation with the congeries of sensations and emotions and feelings which make my momentary state. It has particular traits of its own, which may be difficult to seize, but which, we are bound to suppose, are present. It is doubtless unique, the same with no other, nor yet with itself, but alone in the world of its fleeting moment. But, for logic, and in a matter of truth and falsehood, the case is quite changed. The 'idea' has here become an universal, since everything else is subordinate to the meaning. That connection of attributes we recognize as horse, is one part of the content of the unique horse-image, and this fragmentary part of the psychical event is all that in logic we know of or care for. Using this we treat the rest as husk and dross, which matters nothing to us, and makes no difference to the rest. The 'idea,' if that is the psychical state, is in logic a symbol. But it is better to say, the idea *is* the meaning, for existence and unessential content are wholly discarded. The a totally different import from what naturally belongs to it; it is the pyramid into which a foreign soul has been conveyed, and where it is conserved." This is possible, Hegel says, because intelligence can treat its intuition of time and space "as its own property, deleting the connotation which properly and naturally belongs to it, and conferring on it another connotation as its soul and import" (*Encyclopedia*, §458, Wallace's translation).

¹¹ *Op cit.*, vol. i, p. 4.

idea, in the sense of mental image, is a sign of idea in the sense of meaning."¹² Psychical presentations "are so entangled with their environment, so one with their setting of sensuous particulars, that their character is destroyed if but one thread is broken. Fleeting and self-destructive as is their very endurance, wholly elusive their supposed individuality, misleading and deceptive their claim to reality, yet in some sense and somehow they *are*. They have existence; they are not thought but given. But an idea, if we use idea of meaning, is neither given nor presented but is taken. It can not as such exist. It can not ever be an event, with a place in the series of time or space. It can be a fact no more inside our heads than it can outside them. And, if you take this mere idea by itself, it is an adjective divorced, a parasite cut loose, a spirit without a body seeking rest in another, an abstraction from the concrete, a mere possibility which by itself *is nothing*."¹³

Bradley does not, in *The Principles of Logic*, treat us to a discussion as to how it is possible to mutilate a content of a presentation such that we end up with a fixed and universal meaning, nor as to what process we go through in doing this.¹⁴ Nor are we enlightened as to how it is that a concrete image may be used as a sign for such an abstracted and non-concrete meaning. No doubt we would not ask for such discussions were we not left with the feeling that Bradley has been altogether too successful in

¹² *Ibid.*, vol. i, pp. 5-6.

¹³ *Ibid.*, vol. i, pp. 7-8. Thus we are not so very surprised when we learn that "all meaning must be adjectival," or even when we discover that many of these adjectives are quite unattached and float about loosely. Bradley himself later recognizes the incompatibility of "floating adjectives" with the absolutistic point of view. However, even in his later thought he retains "content loosened from existence," which, it seems to me, still reveals the effects upon the speculative idea of the admission of the actual existence of the empirical idea (under the form of a meaningless mental state or psychical presentation).

¹⁴ Bradley does, in a sense, discuss this problem in an article entitled, "On Pleasure, Pain, Desire and Volition," *Mind*, O. S., xii (1887), pp. 354-381.

distinguishing idea as meaning from idea as fact. He has been so successful that we are inevitably left with the feeling that the natures of the two are quite foreign, and no matter how strongly it is asserted that in genesis one arises out of the other, still at heart they are not of one kin at all. We must not neglect the fact that Bradley often emphasizes that every meaning and every truth has its aspect of psychical presentation. But on the other hand, let us remember that meaning in its nature as meaning is never presented, and truth as truth can not exist. So it hardly seems that there is much gain here. We might well wonder how much unity the notion of aspect affords when that which is characterized as an aspect requires, by its own nature, the destruction of that of which it is an aspect, of that which is supposedly revealing itself in it.

There is one minor point we might notice before leaving *The Principles of Logic*. In judgment, we have seen, we use meanings, not psychical facts. It is due to the confusion of the former with the latter that the notion arises that in judgment there are two or more ideas together with the relations between them. It is true that distinctions can be drawn within a judgment, but it is false to conclude that the unity of the idea in judgment is thus destroyed, and that all that is left is a number of separate ideas and their relations. "The relations between the ideas are themselves ideal. They are not the psychical relations of mental facts. They do not exist between the symbols, but hold in the symbolized. They are part of the meaning and not of the existence. And the whole in which they subsist is ideal, and so one idea."¹⁵ "We shall always go

¹⁵ *Op. cit.*, vol. i, p. 11.

wrong unless we remember that the relations within the content of any meaning, however complex, are still not relations between mental existences. There is a wolf and

a lamb. Does the wolf eat the lamb? The wolf eats the lamb. We have a relation here suggested or asserted between wolf and lamb, but that relation is (if I may use the word) not a *factual* connection between events in my head. What is meant is no psychical conjunction of images."¹⁶ What, in short, we must remember is that in the realm of meaning differences do not destroy identity.¹⁷

Having considered Bradley's treatment of image and meaning in *The Principles of Logic*, let us now turn to relevant discussions in Bradley's writings subsequent to 1883. The distinction between psychical fact and universal reference or meaning, which was emphasized in *The Principles of Logic*, was later to a great extent resolved into the contrast between existence and content and the contrast between immediate feeling and thought. Thus we do not hear so much directly about image and meaning, though the basic dualism is still present in a slightly different form. We are still led to believe, nevertheless, that an idea (a meaning) is attained by the abstraction of a part of the content of a psychical fact from its whole concrete nature and also from its existence or presentedness.¹⁸

¹⁶ *Ibid.*, vol. i, p. 12.

¹⁷ The question arises: Do they in the realm of images? Despite Bradley's emphasis upon the particularity of presentations, it seems certain that for him psychical ideas (as well as logical) always have complexity in unity. At the lowest extreme they must have both "that" and "what," and the "what" must be complex, for out of it, by abstraction, meaning comes to be torn. Hence it would seem that Bradley can not admit, even in the realm of psychical images, that every difference is destructive of identity. Bradley's point, I think, is rather this. In the realm of meaning, there is no difference not expressive of an including identity, whereas in the realm of images, some differences, at least, are expressive of an ultimate non-identity or discreteness.

¹⁸ An interesting and somewhat novel form of the contrast between the idea as logical content and psychical existence is found in a passage on the idea of an idea in "Is there any Special Activity of Attention?" *Mind*, O. S., xi (1886). "The idea of an idea is a psychical state, the character of which is used representatively and contains the feature of being an idea of a certain kind. We must distinguish two varieties. In the first of these the absent idea which I think of is the idea pure and simple, while in the second it will include my psychical state as I have this idea. For example, I possess a general idea of the solution of a problem, and that in the first case contains merely the general character of the answer required, or the principal feature of the necessary process. But if (as in the second case) I think of myself as having the

In several places Bradley warns us against confusing idea with image (in the psychological sense: image, that is, as contrasted with percept). Not only is the idea (the meaning) not an image, but often the symbol (the psychical fact that is used for or refers to the meaning) is not an image but an actual sensory experience. In a passage in an article entitled, "On Pleasure, Pain, Desire and Volition,"¹⁹ Bradley brings this out, as well as the contrast between idea and psychical fact, and something of the genesis of idea. For instance he tells us: ". . . idea is no more equivalent to image than it is to sensation. With me the opposition here is not between external sensation and internal image, for both of these are mere psychical facts." Though image and sensation are different, they are still psychical facts and neither is an idea. For in neither is the content alienated from, indifferent to, independent of its existence. Thus we may have ideas without images, and images without ideas. Still every idea has its aspect of psychical fact. Hence some ideas work from or with content directly presented in sensation. Bradley points out three stages here: an idea which has not worked separate from its sensory basis though it does refer beyond it; a desired content presented in sensation which collides with the sensation, though not itself being presented as a separate image; and an idea which, in the form of a desired content directly in conflict with the sensation, gets presented in a distinct image. Thus the meaning is never an image, and does not always need an image (as distinguished from sensation) to represent it or serve as its starting place in the series of psychical fact.²⁰ In other solution or as performing the process, I must represent also the psychical presence of the whole event, of course again only in its general aspect. Thus, if we realized the first idea we should have simply to fill out its logical content, but the reality of the second would give us its actual psychical existence" (*loc. cit.*, p. 313).

¹⁹ *Mind*, O. S., xiii (1888), pp. 1 ff.

²⁰ Cf. *ibid.*, pp. 22-23.

places Bradley expresses the same warning against confusing idea with psychical image. "It is [commonly] believed that, in order to have something ideal which qualifies an object, we must have an image or images existing separate from that object. . . . But this identification of the ideal with images is surely a mistake."²¹ When perception leads to action in low levels of mind, the idea is "the perceived object, so far as that is qualified inconsistently and qualified in a way that its meaning in part is made loose from itself. This meaning can therefore be applied as an adjective to a fresh subject."²²

Idea, then, is not to be confused with psychical fact, nor particularly with image, for an idea never is a psychical fact, and though based on and using a psychical fact as a symbol, that fact need not be an image as distinguished from a percept. But on the other hand, Bradley tells us that the idea is always the same as the psychical fact in quality, and itself must occur as a psychical fact. This, of course, is in harmony with the doctrine that the idea is an abstracted portion of the content of the psychical fact which serves as symbol. "It should be a commonplace that ideas are psychical realities, and we cannot represent them without using a psychical fact. Further, what represents a pain must be a pain, and so again with pleasure."²³ "It is not wholly true that 'ideas'²⁴ are not what they mean,' for if their meaning is *not* psychical fact, I should like to know how and where it exists."²⁵ "And right as it is to say with Lotze, that ideas are not what they mean, it is also true that ideas can mean nothing but that which they are. For unless a thing has, and to that extent is, a

²¹ *Mind*, N. S., x (1901), p. 441.

²² *Mind*, N. S., xi (1902), p. 462.

²³ *Mind*, O. S., xiii (1888), p. 9.

²⁴ Is "idea" here the psychical fact which represents the meaning?

²⁵ *Appearance and Reality*, p. 51.

quality, I cannot myself understand how it goes about to show it.²⁶ The idea of the extended has extension, the idea of the heavy has weight, the idea of the odorous has smell, and the idea of pleasure, beyond all controversy I should have thought, exists and is so far pleasant."²⁷ "But ideas and perceptions, I shall be told, are not what they signify. It is true, I reply, that their meaning and their existence are different. But if this difference is taken to preclude sameness, the statement would become false. . . . a feature of content, which makes the meaning of an idea, must, I presume, in order to do this, be present psychically."²⁸

If the representing psychical fact and the represented meaning must be the same, the problem arises as to just how to interpret their difference. How, e. g., distinguish between the intensity or extensity of the psychical state and the intensity or extensity of that which is meant? There is, of course, recourse to the distinction between the world of existence and of truth, but Bradley does not play this up to any great extent in the present connection. We seem to be entering a region of some confusion here, but I think I note two types of interpretation. On the one hand, there is the distinction between symbol and meaning which claims that the symbol is richer in content than the meaning. The excess qualities of the symbol, irrelevant to the meaning, may differ in various ways. Thus they may differ quantitatively independently of the quantity of the content abstracted in the meaning. This interpretation Bradley uses in explaining how the strength or in-

²⁶ Bradley's footnote: "The existence of conventional and arbitrary signs, and of mere accredited representatives, forms no valid objection. For unless the meaning is *somewhere* there and belonging to the sign, the sign would be no sign. The question is merely as to *how*, within the whole actual sign, the meaning and the existence are in each case connected—whether, that is, they are connected indirectly and through external association and credit, or directly and through an internal property."

²⁷ *Mind*, N. S., iv (1895), pp. 20-21.

²⁸ *Ibid.*, p. 225.

sistency of the psychical state may differ from that which is meant. "For in the being of an idea I find always psychical matter extraneous to its meaning, and this unemployed content, I must insist, can vary in quantity, while the specific meaning of the idea remains identical."²⁹ On the other hand, the psychical fact, the symbol, differs from what it means because it is abstract and incomplete, and leaves out some of the conditions of the latter. This seems to be Bradley's view when he is explaining the difference between the psychical extension of our mental states and the extension meant by them, i. e., the physical extension of the external world. "For when we perceive a sequence in nature we perceive in this but one feature of the whole. The result observed does not follow really and in fact except for complete conditions, and to experience these complete conditions is quite impossible. . . . We are right to deny that the physical extended in its full process has psychical existence."³⁰

We may say, then, that the distinction between psychical fact and meaning still persists in Bradley's thought subsequent to 1883. The idea is not the image, nor any other fact, for it is abstracted content cut loose from existence. Yet, peculiarly, the meaning must be psychical fact, and must be in some respects the same as its symbol.

Let us turn from exposition to critical evaluation. My first point is that Bradley's sharp distinction between particular psychical occurrences and universal logical meanings is out of keeping with the teachings of absolute idealism. This point I believe should have become clear of itself through the previous exposition. The central principle of absolute idealism is that of the concrete universal, of systematic connection, of the immanence of the whole in

²⁹ *Ibid.*, p. 20.

³⁰ *Ibid.*, pp. 226-227.

all its parts. On last analysis, nothing is irrelevant to the speculative idea; every difference is included within it as an organic aspect of its own identity. Bradley's position undermines this in two ways. It admits, in the psychical fact, that irrelevant, merely particular ideas do exist. And, as a result of this admission, it accepts abstract universals. The first admission destroys the doctrine that every difference is an expression of a universal or whole of meaning. The second, overthrows the doctrine that every universal is concrete. Why, then, did Bradley ever allow the empirical idea to gain leverage in his system? First, no doubt, we have here a result of Bradley's bitter struggle against English empiricism—an imprint of the enemy's weapons. Again, Bradley probably felt that the empirical idea (in the rôle of a mental state) was basic to the science of psychology, a science which was just growing up and toward which Bradley had friendly feelings.³¹ But finally, and I think fundamentally, it was Bradley's way of admitting the indubitable, experienced fact of irrelevant conjunction, of the externality of our ideas to one another.

This leads to my second problem. Apart from what absolute idealism may or may not demand, is Bradley's interpretation of image and meaning and their relation intrinsically tenable, or does it involve certain almost insuperable difficulties?

It was interesting to me to come across the following statement, published forty-four years after *The Principles of Logic*. "Separation of meaning from the psychological nature of ideas belongs to the most secure generalizations of modern philosophical science."³² If this is so, then we must admit that all the zeal of F. C. S. Schiller has been

³¹ See, e.g., his article, "A Defense of Phenomenalism in Psychology," *Mind*, N. S., ix (1900), p. 26.

³² Henry Lang in *The Open Court*, xli (1927), p. 385.

wasted! However, even in men worthy of serious consideration³³ we find a few hints of dissatisfaction with Bradley's treatment of the relation between image and meaning.³⁴

Perhaps the most searching criticism of Bradley's doctrine of image and meaning is to be found in an article by G. F. Stout on "Mr. Bradley's Theory of Judgment."³⁵ It follows from Bradley's view of the relation of sign and meaning, Stout contends, that "whenever we think of or apprehend anything as having a certain qualification, the characters we have ascribed to it are wholly contained within our own psychical state at the moment."³⁶ This follows from Bradley's insistence that any meaning predicated is always a part of the content of the mental state which is the symbol. But Stout rejects this view. The content of the psychical state which functions as a symbol is often fragmentary in comparison with the idea (meaning), and sometimes wholly different from what we mean to predicate. "There are instances in which the specific nature of an object of thought as such does not seem to correspond even partially to any assignable content of our psychical state at the moment." This occurs, for example, in silent or spoken thought, where the symbols are conventional linguistic signs. It seems absurd to say that the meaning of a spoken word is a part of its content.³⁷

³³ I have in mind here a passage by Bradley, *Essays on Truth and Reality*, p. 274.

³⁴ Henry Jones criticizes Lotze's doctrine that the datum of knowledge is a merely subjective state objectified by thought. Jones' objection is that if we start from mere subjective states, we have no way to get to knowledge, to meaning, to the objective (cf. *A Critical Account of the Philosophy of Lotze*, pp. 105-115). I think this criticism is sound, and I also believe that it applies to Bradley's image and meaning. E. P. Robins has pointed out ("Modern Theories of Judgment," in *The Philosophical Review*, vii (1898), pp. 583-603) that by starting from a psychical image, Bradley and Bosanquet follow the lead of such logicians as Sigwart and Lotze in admitting a wholly subjective datum from which thought starts. And hence they do not really escape subjectivism and representationalism.

³⁵ *Proceedings of the Aristotelian Society*, N. S., iii (1902-1903), p. 1.

³⁶ *Ibid.*, p. 6.

³⁷ Cf. *ibid.*, pp. 8-15.

Again, Stout rejects Bradley's view that the idea predicated is always cut loose from the psychic state and used to qualify something else. If this were true, no one could ever become aware of the contrast between the content as a logical idea and as a part of the psychic state. "If, then, it is essential to judgment that the contents of immediate experience are cut loose, divorced, alienated, from their existence as contents of immediate experience,—if judgment merely consists in ascribing these 'wandering adjectives' to something else,—it does not seem possible that we should ever become able to predicate anything concerning immediate experience, either truly or falsely."³⁸

R. F. A. Hoernlé, in an article on "Image, Idea and Meaning,"³⁹ largely follows Stout in his criticism of the theory of ideas as expressed by Bradley. It seems absurd to hold, Hoernlé urges, that logical meaning is a mere fragment of the psychical image. "On the contrary, it would be truer to say, that our meaning is *far fuller* than anything contained in the image."⁴⁰ It does not help matters to speak of 'fixing' a part of an image and of 'referring it away to another subject.' For whatever character we fix on is the particular character of that image, and is not, as such, referred to other subjects. For example, the redness of a given image is a particular red and is not the redness we predicate of some other subject. "The meaning lies beyond the image, and no operation on the image will get us to the meaning. And in any case it is unintelligible how this particular element of a particular image should lose its particularity by being 'referred away to another subject.'"⁴¹

The theory gains its plausibility, Hoernlé thinks, by

³⁸ *Ibid.*, p. 15. A psychical idea can not, for Bradley, be an idea of anything. But if so, Stout contends, it can not be an idea even for psychology.

³⁹ *Mind*, N. S., xvi (1907), p. 70.

⁴⁰ *Ibid.*, p. 73.

⁴¹ *Ibid.*, p. 73.

holding that images⁴² alone are signs. Otherwise it would be impossible to hold that there is a partial identity between the sign and its meaning. But how are we to explain meaningful experience in cases where there is defective imagery? Or, as Stout urges, how are we to account for meaning when the signs used are words? Hoernlé likewise agrees with Stout that all ideas (even 'psychological' ideas) are *of* something. "Indeed, I should be prepared to uphold the paradox that there is no idea, or combination of ideas, which is wholly meaningless."⁴³

Quite similar in spirit to these criticisms by Stout and Hoernlé is a critical analysis of the problem of immediacy and meaning by Professor G. P. Adams.⁴⁴ The task Bradley set himself, says Professor Adams, was to develop all the distinctions of meaning, judgment, thought out of the characters to be found in our immediately felt psychical states. Bradley failed in this attempt, however, and he failed precisely because he started from a false initial premise. There is no wholly immediate experience, Professor Adams contends. All experience has its aspect of meaning; it comes in a context; it comes as relational and as having a reference beyond the content which is immediately present. Hence Professor Adams rejects the view that "the predicate is always a present content of immediate experience, even if that content be supposed to be used only as a logical meaning and not as a psychical image. The process by means of which the logical meaning is cut loose from the psychical image—and I should follow Bradley in recognizing such a process—is one in

⁴² Images in the narrower psychological sense. We have noted that Bradley rejects Hoernlé's contention on this matter. But Bradley has not dealt with cases where there is (so far as we can see) no identity of content between the sign and its meaning. He avoids it by speaking of an "accrued" content of the image.

⁴³ *Ibid.*, p. 75.

⁴⁴ *Proceedings and Addresses of the American Philosophical Association*, 1927, vol. i, p. 109, reprinted from *The Philosophical Review*, xxxvii (1928).

which the logical meaning, the predicate, acquires a content other than any content or character immediately experienced. The logical meaning is not solely a mutilated and impoverished fragment of felt immediacy; it is a richer content, saturated with characters which could never be compressed within the poor and momentary content of immediate experience.⁷⁴⁵

Personally, I find two chief difficulties in Bradley's treatment of image and meaning. The first is that I can not see how he gets two such radically disparate things into any sort of unity. The meaning is somehow developed out of the image. But just how can an objective, permanent, universal adjective be developed out of a wholly private, fleeting, particular fact? This I do not understand, and I am not helped by hearing that the mind 'fixes' and 'objectifies' the latter. Such vaguely suggested miracles may satisfy the superstitious, but they ought not to pass as adequate philosophical explanations. No mere specific, it would seem to me, can ever become universal. It may be possible that what is only implicitly universal may become explicitly so, or that what we mistake for a mere particular may, upon investigation and experiment, turn out to be universal. But this is a different matter. Furthermore, if an image or psychical fact is what Bradley (in *The Principles of Logic*) portrays it to be, it can not be a sign. Surely anything that functions as a sign must

⁴⁵ *Ibid.*, p. 125. For other criticisms of Bradley's theory of image and meaning, see W. C. Gore, "Image and Idea in Logic," in *Studies in Logical Theory*, by John Dewey and others, p. 184; and J. Laird, "The Nature of Ideas," in *Proceedings of the Aristotelian Society*, N. S., xxv (1924-1925), especially p. 254. Gore emphasizes the point that the Bradleyan analysis treats meanings alone (not images) as of logical importance. Gore objects to this, "It is only as the sense-contents of various images are discriminated and compared that anything like thinking can be conceived to go on. The particular sense-content of an image, instead of being a matter of logical indifference, is the condition, the possibility, of thinking" (*loc. cit.*, p. 201). Laird objects to Bradley's treatment of adjectives as images loosened from sensuous apprehension: "... it is quite impossible that images and predicates should be the same" (*loc. cit.*, p. 254).

itself be to some extent universal, for it is mediatory and referential. And so, in general, I feel that Bradley has split image and meaning so completely asunder that he can not really get them together again. Yet there is truth in his view that in psychical fact we have particularity and change, whereas in meaning we have universality, permanence, etc. Just what this element of truth is we shall inquire into presently.

My other chief difficulty with Bradley's views on image and meaning is that I can not agree that the meaning is a mere fragment of the content of the image (taken as sign). This criticism we have already seen to be urged by Stout, Hoernlé, and Adams, and so I need not pursue it further. It seems indubitable to me that what a sign means always lies beyond it, and hence is not wholly included in it. The signified must be external to the sign. On the other hand, it is true that the sign can not be *merely* external to the meaning. So far, I should agree, Bradley is correct. The sign is what it means.

As I see it, Bradley's difficulty lies right here. He sees that our ideas have an aspect of mere occurrence and particularity. But by sundering this from their self-transcendence, their universal meaning, he lays himself open to the charge of self-contradiction when he claims that after all meaning and image are the same.

The truth is, ideas are both particular occurrences and self-transcendent meanings. They are externally related to each other and they internally involve each other as elements in a systematic whole. But how unite these aspects? I should like to offer two suggestions. The first is that the distinction between idea as image and as meaning is always one of degree. It is never absolute. The second is that we can solve the present problem only if we distinguish between meaning and the meant.

More definitely, my suggestion amounts to this. Both the psychical fact which serves as a sign and its meaning are aspects of an identity including them both, viz., the object meant. Hence image and meaning are one—they are features of a common identity. But they do not play the same rôle in this common identity. And it is this difference which makes it necessary to urge that the meaning is quite other than the idea taken as a mere fact or occurrence.

To make my point clear I shall have to digress long enough to make a dogmatic statement as to the nature of a real object or identity. A 'real' identity embraces all the characters truly predicable of the identity, no matter how trivial. But these characters are not all of equal importance to the identity. Some form a nucleus whose precise character is necessary to the identity. In contrast with this nucleus, there is always a mass of detail—irrelevant characters which are truly predicable of the identity, but which are not, *in their specific nature*, necessary to the identity (though that there be such a mass of detail is necessary). This mass of irrelevant detail furnishes the change and difference or 'non-identity' which is, as a *general* requirement, rationally necessary to the identity, and which is in its specific nature actually included in the identity, but which is not the identity, for it is not, in its *specific* character, essential to the identity. The identity would remain even though the specific character of this mass of detail were actually different. In brief, real identity both includes all its features and is focalized in or peculiarly restricted to a few of those features which form its core or focal structure.⁴⁶

⁴⁶ Formal identity may be expressed: $A = A$; that is, in formal identity, differences are wholly cancelled or excluded from identity. Identity is ultimately reduced to identical elements which are simply no different. "Identity in difference" is ambiguous, but may mean simply: $abc = abc$; that is, every

The meant is always a total real identity, in all its concreteness. Our ideas are always partial or incomplete identities, which refer beyond themselves precisely because of this incompleteness. But simply because all our ideas are partial and thus self-transcendent, it does not follow that they are all equally so. An idea may be the very core of the meant, or, at the other extreme, it may be a very minor detail. In the former case, the idea is as permanent as the identity to which it 'refers.' In the latter case, it is a fleeting 'sign' which apparently has no stability. In the former case, it is obviously self-transcendent; it is the nature or essence of something more concrete and inclusive than itself. In the latter case, the tendency is to take it as a mere fact, as what it directly comes as (though, inconsistently, it is still 'of' something). In the former sense, we have the idea as a logical meaning. In the latter, we have it as an image or psychical fact. On this basis we can see why (as in Bradley's case) image and meaning should be so basically distinct as to be almost entirely external to each other. The psychical image is a mere detail of the identity meant, and hence it could have been otherwise and still have been a sign or image of the meant. But the logical meaning is the essential nature of the meant, and it could not have been different, the object meant remaining what it is. Let me urge, however, that this distinction is not absolute. Just as many if not most of the features of an identity are neither absolutely necessary to it nor wholly irrelevant factual details in it, so most ideas neither omit entirely all features essential to their object

identity includes all its differences as essential elements, and hence would be destroyed if any of them were inadvertently dropped out. The doctrine I suggest, of "focalized identity," may be symbolized: $bAc = dAc$. However, this symbolization is inadequate, for it does not show clearly that the identity does as a matter of fact include the changing details (bc and de) while yet (as focalized in its rational essence, viz., A) it is to be contrasted with this non-identity of detail.

nor do they give us the complete focal structure of their object.

This point of view modifies the 'speculative idea' so as to admit the factor of externality emphasized by the 'empirical idea.' But the result is not a thorough split, as seems to be the case with Bradley, between existenceless, abstract, logical meanings and wholly factual, specific, psychical images. It rather, I think, points to the need of a fundamental rapprochement between the speculative and the empirical points of view.

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MR. RUSSELL'S THEORY OF PERCEPTION

SOME fifty years ago Lotze wrote: "it seems likely that after reaching a certain limit in the extent and depth of its enquiries, natural science will feel the need, in order to the possibility of further progress, of reverting to the task of defining exhaustively those centers of relation to which it had previously been able to attach its calculations while leaving their nature undetermined. In that case it will either originate a new Metaphysic of its own or it will adopt some existing system."¹ The third decade of the present century has witnessed the fulfilment of this expectation. Numerous attempts have recently been made to re-define those "centers of relation," and among these the writings of Professor A. N. Whitehead and Mr. Bertrand Russell are especially prominent. These attempts have inevitably involved a re-examination of the problems of epistemology, and the present paper will be confined to a discussion of certain features of Mr. Russell's views on these problems, with some comparison of his views with those of Professor Whitehead.

In his *Analysis of Mind* Mr. Russell wrote (pp. 97-8): "It was natural, though to my mind mistaken, to regard the 'real' table as the common cause of all the appearances which the table presents (as we say) to different observers. But why should we suppose that there is some one common cause of all these appearances? As

¹ *Metaphysics*, Bk. I, § vii.

we have seen, the notion of 'cause' is not so reliable as to allow us to infer the existence of something that, by its very nature, can never be observed." In his two recent works—*Outline of Philosophy* and *Analysis of Matter*—Mr. Russell appears to have adopted the view which he here so clearly repudiates and, in spite of all he has previously written about the notion of causation, he now makes it the very foundation of his philosophical doctrines, but without any satisfactory explanation of the reasons which have led him to this change, and without removing the doubts in which he had formerly held this notion. The reader is therefore left in considerable bewilderment, which is further increased by the unnecessarily paradoxical air of many of Mr. Russell's newer utterances, and the equivocal use of language in many of them.

Mr. Russell's general conclusions regarding our knowledge of what physicists suppose themselves to be studying are summed up in the following passages: (1) "The only legitimate attitude about the physical world seems to be one of complete agnosticism as regards all but its mathematical properties."² (2) "By examining our percepts we obtain knowledge which is not purely formal as to the matter of our own brains."³ Mr. Russell also states that inferences regarding even the formal mathematical properties of "external matter" are "not demonstrative or certain." The question then presents itself whether, on this basis, the knowledge upon which Mr. Russell's theory of perception itself rests has the character the theory requires, or whether it is not in too much need of foundations to be capable of supporting such a superstructure.

We can begin by considering a passage which illustrates Mr. Russell's method and standpoint with special

² *Analysis of Matter*, p. 270.

³ *Ibid.*, p. 382.

vividness: "What the physiologist sees when he looks at a brain is part of his own brain, not part of the brain he is examining. The feeling of paradox about this view comes, I should say, from wrong views of space. It is true that what we see is not located where our percept of our own brain would be located if we could see our own brain; but this is a question of perceptual space, not of the space of physics."⁴

The reader will probably agree that the paradox rests partly on wrong views of space, although he may have doubts about the ownership of those views. But he can hardly be blamed if he attributes it in part also to Mr. Russell's equivocal use of the word "see." First we are told that *all* the physiologist *can* see is part of his own brain, and then that *if* he *could* see his own brain the percept he would have of it would not be located where what he does see is located. It would be difficult to find a more needlessly confused passage than this in the whole of philosophical literature, or one which illustrates to greater perfection all those errors which Mr. Russell has so often called attention to in the writings of others. One would gather from it (if one can gather anything) that there are not only two spaces, but two brains and two meanings of the verb "to see," but what their connexion may be seems to be left in great obscurity. And yet Mr. Russell gives, as a reason for his view that "the whole of our perceptual world is, for physics, in our heads," the assertion that otherwise "there would be a spatio-temporal jump between stimulus and percept which would be quite unintelligible." Any other view, he says in the *Outline*, would involve a "preposterous kind of discontinuity." Thus the reader is encouraged in the hope that a difficulty previously felt is about to be removed, that something which

⁴ *Ibid.*, p. 383.

has been unintelligible for previous theories is here at last explained. But what are we to say of the "intelligibility" of the seemingly miraculous jump from the space of physics to perceptual space which the "cause" is required to perform; and how are we to interpret the "discontinuity" between the brain which is *all I can* see and the brain I *could* see but don't?

Putting these difficulties aside for the moment and construing Mr. Russell's assertions as sympathetically as possible his view seems to be somewhat as follows: When a physiologist is said to be "seeing a brain" there is an entity *B* which is a bit of "external matter" and which he is (1) looking at, and (2) examining, but not (3) seeing. Of this he only knows the mathematical properties. But there is another entity *b* which he *does* see and which, although not part of *B*, is a part of another entity sufficiently like *B* to be called "another specimen of a *B*," and which is also part of the physiologist. The physiologist can also *examine* this *b* and thereby obtain non-formal knowledge of his own specimen of a *B*. Moreover he knows or supposes that the *b* he is seeing has been caused by the *B* of a minute fraction of a second ago in the sense that had that *B* not been where it was he would very probably not have seen *b*. But Mr. Russell apparently holds that all that is in any sense given consists of percepts, such as *b*, the rest, namely *B* and the causal relation, being at best doubtful assumptions, although not so doubtful, apparently, as they were when *The Analysis of Mind* was written.

The following passage also illustrates Mr. Russell's view and provides material for a more detailed analysis: "It is a fallacy to argue, as is sometimes done, that, if we cannot trust our senses, we cannot know that we have sense organs, or that there is any truth in physiology. If we find that several people, looking at Jones, see him just

as usual, while one person sees him looking queer; if the several see nothing queer in each other's eyes, while they all see something queer in the eyes of the one, in such circumstances, I say, it is natural and proper to correlate the two queernesses. The man who sees Jones differently from usual sees him through a medium which has an unusual effect; there is no more ground for scepticism than is to be derived from the effect of opera glasses. The sceptical argument is only valid as against naive realism."⁵ Quite so; but how is such an argument possible on the basis of Mr. Russell's theory? Let us try to discover some of the essential presuppositions which this argument requires. This undertaking is confronted with a special difficulty created by the fact that Mr. Russell's theory apparently makes no provision for a "percipient." Percepts apparently just bob up in people's brains from time to time and get themselves labelled "queer" or "as usual" but there seems to be no provision for processes of perceiving or comparing. But as Mr. Russell himself speaks of someone "looking at Jones" and "seeing him just as usual" it is presumably permissible to refer to that person as a "percipient" without making any metaphysical assertions about his "nature."

The first point to mention is, of course, that no one does in fact see Jones, according to Mr. Russell. Let us say then that one man *A* sees a percept *J* which (1) is a part of *A*'s brain, and (2) is causally dependent upon an entity called Jones and in virtue (partly) of this relation is called a percept "of" Jones. (3) This percept *J* is compared with at least one other percept seen by *A* on a previous occasion when it was also a percept "of" Jones, the result of this comparison being that *J* is pronounced to be "just as usual." Next let *B* be another observer who participated in the above incident. He sees a percept *J'* which

⁵ *Analysis of Matter*, p. 262.

(1) is a part of *B's* brain; (2) is causally dependent upon the *same* entity called Jones as *A's J* was dependent upon and is also called a percept "of" Jones. (3) *J'* is also compared with previously seen parts of *B's* brain which were percepts "of" Jones, and pronounced to be "just as usual." Finally, a third observer *C* sees a percept *J''* having properties analogous to *J* and *J'* of the brains of *A* and *B*, but with the important difference that when *J''* is compared with previous percepts "of" Jones it is found to "look queer."

Now *A* also sees two percepts *Eb* and *Ec* such that (1) each is part of *A's* brain; (2) *Eb* is a percept "of" a part of *B*, namely *B's* eye, and *Ec* is a percept of a "corresponding" part of *C*; (3) a comparison of *Eb* with *Ec* and of each with previously seen percepts of corresponding parts of *B* and *C* respectively leads to *Eb* being described "as usual" and *Ec* being described as "queer." *B* sees analogous percepts *Ea'* and *Ec'*, such that *Ea'* resembles *Eb* in being "as usual" and *Ec'* resembles *Ec* in being "queer." Also *C* sees analogous percepts *Ea''* and *Eb''* but *both* "look queer," and consequently *Ea''* differs from *Ea'* and *Eb''* differs from *Eb*.

Now in any causal investigation we always have a *comparison* of two situations, and if they are found to differ with respect to the determinate characters manifested under a given determinable then the causal postulate leads us to assert that there is *another* pair of differences correlated with the pair observed, even although the second pair is not observed. We are led to expect a *symmetry* of pairs of differences. Let us suppose that *A* is conducting the inquiry on the present occasion. Let us assume that he knows that *J* differs from *J''*, then he will argue *either* that the Jones of which *J* is a percept is not the Jones of which *J''* is a percept, or that there is a difference between some

other causal elements in the situation. *If* now he *also* knows that Ea'' differs from Ea' and that Ec differs from Eb , but not from Ec' , and *if* he knows that J and J'' both depend upon the entities of which Ea'' , Ec , and Eb are percepts, then *if* he *also* knows that the Jones of which J is a percept is *not* different from the Jones of which J'' is a percept, he may conclude that the difference between J and J'' is correlated with a difference between the eye of A and the eye of C .

Summarizing the requirements for this argument we have at least the following:

(1) The percepts of any given percipient, A say, fall into certain classes as follows. If α is a class of percepts of A then there is (in Whiteheadian language) some historical route r every temporal stretch of which has at least some properties in common with every other stretch, and every member of the class α of A 's percepts is a term in a many-one relation to this historical route (e.g., the route pervaded by Jones).

(2) It must be possible for the members of a class of percepts of B to stand in a similar relation to the same historical route r as that in which the members of α stand to it. And it must be possible for A to know when this is the case.

(3) It must be possible for a percipient to compare one percept correlated with a given route with a previously perceived percept correlated with the same route, although of course with a different part of it.

(4) It must be possible for a percipient to compare a percept correlated with one route with another percept correlated with a different route.

(5) It must be possible for a given percipient such as A to know that a certain percept p' , of another percipient such as B , which is correlated with a certain route r is

different (or not different) from his own percept p which is correlated with approximately the same stretch of the same route r .

(6) The following inference must be possible for such a percipient as A : If P and P' are two percepts of different percipients but both correlated with approximately the same part of the same historical route r , and such that P is qualitatively different from P' ; and if p and p' are two other percepts, of the same two percipients, such that p is correlated with an historical route r' and p' with another route r'' , and p is qualitatively different from p' ; and if the character of P is dependent upon r' and that of P' on r'' , then the difference between P and P' is causally correlated with the difference between r , and r'' .

Now according to Mr. Russell A 's knowledge is confined to (1) the mathematical properties of the external world, with complete agnosticism regarding any other properties it may have; and (2) "knowledge" which is not purely formal about the matter of his own brain obtained by an inspection of his own percepts. But requisite (5) above is absolutely essential for Mr. Russell's argument. It is essential that A should know that his J resembles B 's J' in "looking just as usual," and that his Ec resembles B 's Ec' in "looking queer." But now B 's Ec' is a percept and hence, according to Mr. Russell a part of B 's brain, and if A knows that it looks queer, and if looking queer is a non-formal property, it follows that A has knowledge which is not purely formal of the external world, since B 's brain is a part of the external world of A . Thus, although A cannot see B 's brain he knows something about it which he cannot know by looking at it or "examining" it, and this knowledge is essential for Mr. Russell's theory of perception, although it does not seem to be provided for by Mr. Russell's conclusions.

Another important point which does not seem to be provided for, having regard to the doubts attaching (according to Mr. Russell) to our knowledge of even the mathematical properties of "external matter," is the following: If percepts are the kind of entities that can "be in" heads, if our percepts *are* in our heads, and if we *know* this fact about them, then clearly we have some *other* source of knowledge over and above that provided by the bare "examination" of our percepts, as Mr. Russell describes them. For we do not observe a spatial relation between our heads and our percepts on this theory. We see our percepts but we do not see our heads. Our alleged knowledge *that* we have heads, and *that* our percepts are *in* them, we must owe to some other source. A percipient who never perceived anything but percepts in his head would clearly have no ground for believing (a) that there *were* brains, and (b) that the entities he perceived were parts of one of these brains. Thus Mr. Russell's theory not only demands that *A* should know that *C's* percept *J''* is different from his own percept *J*, but also that both of these percepts relate to the same entity Jones which is not a percept. Mr. Russell makes no real provision for this.

We must consider what it can possibly *mean* to say that "The whole of our perceptual world is, for physics, in our heads." How do we come by the notion of "being in"? Let us consider the proposition: "A match-box is *in* that room." This is a proposition which would ordinarily be taken to assert a fact, not about brains, but about what is called the "physical world," a fact, moreover, belonging to a large class of facts which have the peculiarity of being *public*. The number of percipients who could know this fact is limited only by the number of people who can be packed into the room, or who can crane up their heads far enough to see into the windows. The essential point about

the proposition so far as "in" is concerned is roughly as follows: If the whole three-dimensional spread of what is called the room is exhaustively analysed into a number of equal volumes then a certain number of these volumes suitably chosen will also be an exhaustive analysis of the three-dimensional spread of what is called the match-box. No possible analysis of the latter will yield a volume which is not also a volume obtained by an analysis of the room. Thus "being in" is, in this case, a relation between two three-dimensional entities (time being the same for both), which is theoretically capable of being apprehended by any number of percipients. But Mr. Russell appears to make no provision for any such apprehension. All that his percipients can perceive are parts of their own brains.

But now, can a percept stand in the above relation of "being in" to anything? Can a percept be a value of x in the function " $\hat{x}$ is in a head"? If not, the assertion that percepts are in heads is not a proposition at all but a meaningless string of noises or print-marks. When I look at the match-box I seem to perceive a relation between the room, the match-box and my body—these entities being marked out from one another by a display of coloured spreads. Three such spreads distinguish the match-box. The top is yellow, one side is blue, and another is black. Also I find that by stretching out my arm I can experience certain tactual percepts in virtue of which I call the box "tangible" or "solid." But it would be perfectly possible, by a suitable contrivance, to perceive the display of coloured spreads without any tactile experience being correlated with the *same place*. Thus coloured spreads may *appear in* places without being correlated with other percepts, but they always *appear in* some place, and *that* place always *is in* another place of greater spatial extent. This

suggests that "appearing in" a place is a different relation from "being in" a place. It is only the three-dimensional volume of the match-box—marked out for perception by the coloured spreads—which stands in the relation "being in" to the volume of the room. Moreover the relation "appearing in" involves a reference to a percipient, whereas the relation "being in" does not. But if this is the case a percept can never be a value of x in " x is in a head." Neither can a percept stand in the relation "appearing in" to a head, with the possible exception of head-aches, if the head is the head of the percipient. All percepts of that percipient stand, for him, in the relation "appearing in" places outside his skull. If we are to make any sense at all of the bulk of what passes for knowledge, it is necessary that we should in some way, and in some sense, be able to perceive places outside our skulls, so that A in our example can know that his percept J is a percept "of" the same Jones of which C 's percept J'' is a percept. And any theory of knowledge which does not enable us to make sense of what passes for knowledge may reasonably be asked to explain the success of this common knowledge, but *without appealing to it itself*, and this is not usually done.

Now according to Mr. Russell the space we perceive is perceptual space, and this *is in* our skulls and our skulls *are in* the space of physics. But what does this mean when we translate it into modern terms based on the recognition that space is derived by a process of abstraction from a four-dimensional continuum? What grounds are there on Mr. Russell's theory, for speaking about any space at all other than perceptual space? Mr. Russell himself furnishes a hint towards an answer to these questions in a passage in his *Outline of Philosophy*, although it is only a hint and does not seem to be provided for in the theory

itself. After explaining that modern physics "reduces matter to a set of events which proceed outward from a centre" he adds: "if, therefore, we see red and blue side by side, we are justified in inferring that *in the direction* where we see red something different is happening from what is happening in the direction where we see blue." The words I have italicized seem to suggest that there is, after all, a way out from perceptual space to the space of physics. But according to Mr. Russell this direction will be a direction in perceptual space. Only if the direction which I immediately apprehend is itself a direction in the "space of physics" will it be possible to make the inference Mr. Russell makes. Thus whatever may be the case about the spatial relations of percepts (in the sense of "being in"), assuming they have any, it must be possible to "see" or in some way apprehend at least the *directions* of "the space of physics," even in order to obtain the basis for Mr. Russell's theory.

Thus in the ordinary accounts of perception as represented by Mr. Russell something essential is not officially allowed for but is introduced by vague hints and back-door methods—exposing such theories to the charge of inconsistency, or of arriving at a feeble scepticism which no one takes seriously. Among modern writers Professor Whitehead seems to stand almost alone in his method of dealing with this missing ingredient and in his persistent rejection of all theories which fail to recognize it. A fundamental tenet of Prof. Whitehead's doctrine is the recognition of two totally different elements in nature: four-dimensional spatio-temporal entities which he calls events, on the one hand, and non-spatial, non-temporal entities called objects, on the other. He has also perceived that the relation between certain objects (which include Mr. Rus-

sell's percepts) and events is a much more complex one than we have been led to suppose under the influence of the Aristotelian notion of substance and attribute standing in a two-termed relation to one another. Moreover the relation between objects and events is different from the relations between events—thus providing a basis for the difference between “appearing in” and “being in.” In all his books Prof. Whitehead has urged the two-fold aspect of perception. In the *Principles of Natural Knowledge* there was apprehension of events and recognition of objects. In the *Concept of Nature* there was the difference between the discerned and the discernible. In the *Principle of Relativity* we have “cognisance by adjective” and “cognisance by relatedness.” “Your knowledge is not merely of something which is red. The patch is *there* and it endures while you are observing it. Thus you are cognisant of it as having spatio-temporal position, and by this we mean a certain type of relatedness to the rest of nature which is thereby involved in our particular experience.”⁶ In Prof. Whitehead's last two works—*Symbolism* and *Process and Reality*—a corresponding distinction is made and worked out between the “two perceptive modes” of “presentational immediacy” and “causal efficacy” with an interplay of “symbolic reference” between them. Mr. Russell's theory provides only for perception under the first mode, leaving physics and physiology (upon which it professes to base itself) with no place in the scheme at all, since they deal with hypothetical entities in a hypothetical causal relation. As Prof. Whitehead puts it: “the physiological explanation remains, from the point of view of Hume's philosophy, a tissue of irrelevancies. It presupposes a side of the universe about which, on Hume's

⁶ *Principle of Relativity*, p. 62.

theory, we must remain in blank ignorance.”⁷ Those who follow Hume and Mr. Russell are committed to a perpetual wavering in their attitude towards natural science. There is a passage in which Prof. Whitehead describes the part played by these two aspects of perception in scientific observation so aptly that it will perhaps be permissible to quote it in full: “The respective rôles of the two perceptive modes in experience are aptly exemplified by the fact that all scientific observations, such as measurements, determinations of relative spatial position, determinations of sense-data such as colours, sounds, tastes, smells, temperature feelings, touch feelings, etc., are made in the perceptive mode of presentational immediacy; and that great care is exerted to keep this mode pure, that is to say, devoid of symbolic reference to causal efficacy. In this way accuracy is secured, in the sense that the direct observation is purged of all interpretation. On the other hand, all scientific theory is stated in terms referring exclusively to the scheme of relatedness, which so far as it is observed, involves the percepta in the pure mode of causal efficacy. It thus stands out at once, that what we want to know about, from the point of view either of curiosity or of technology, chiefly resides in those aspects of the world disclosed in causal efficacy: but that what we can distinctly register is chiefly to be found among the percepta in the mode of presentational immediacy.”⁸

Finally, objection may be made to Mr. Russell’s assertion that an examination of our percepts yields us *knowledge* which is “not purely formal” concerning “the matter of our own brains.” This assertion as it stands cannot possibly mean what it says. Otherwise it would indeed be strange that physiologists and anatomists should, in order

⁷ *Process and Reality*, p. 246.

⁸ *Process and Reality*, p. 238. Cf. the whole of Part II, Ch. viii.

to obtain such knowledge, have devoted long laborious lives to the study of the brains of other people, after subjecting them to tedious and complicated technical processes; and that they should be so mistaken about the character of the knowledge thus obtained, when it could have been reached equally well by the examination of their own percepts of bath-chairs or fire-irons. Surely the only *knowledge* that I can be said to obtain by the bare examination of my percepts as such is that they are sometimes, say, round and red, or smooth and cold, and so forth. I cannot, without further data, pass from this to the assertion that my brain is round and red or smooth and cold. I must first learn, not by "examining my percepts" in Mr. Russell's sense, but by exercising *both* perceptive modes, that there are spatio-temporal entities called brains. I must next be able to infer that I have a brain and that when I am sensing a red patch I am sensing a red part of my brain. But this is not *knowing* my own brain. From the point of view of *knowledge*, as contrasted with bare *sensing*, my own brain is not in any privileged position. Since I get knowledge of *other* brains first, and since I reach this knowledge by using my percepts (not my percepts as such but only certain ones known to be "of" other brains) this process of "examining" my percepts cannot be said to give any information of special merit in relation to my own brain. Mr. Russell's paradoxes seem to rest very largely on his confusing of sensing and knowing. My contention is that sensing percepts and knowing brains are two totally different processes. Mr. Russell appears to be urging that we can have qualitative knowledge only of our own brains, when it would be more correct to say that we can have such knowledge only of our percepts, e.g., that they are sometimes red. We are not entitled, without further ado,

to pass from this to the assertion that this is *knowledge* about the matter of our brains. There is, moreover, another difficulty. Mr. Russell says that physics has "reduced" matter to a "set of events which proceed outward from a center," but he gives no explanation of the relation between the brain in the guise of "matter" as a set of events proceeding from a center, and the brain in the guise of, say, the smell of sulphuretted hydrogen. The latter does not seem to have the character of a set of events proceeding from a centre, and yet, according to Mr. Russell, when I smell it I am having non-formal knowledge of my brain which is matter and hence a set of events proceeding from a center. Between these two aspects of the brain there is, even in Mr. Russell's theory, a "preposterous kind of discontinuity" which is "quite unintelligible." This discontinuity is not, therefore, overcome after all by identifying our percepts with parts of our brains and putting them in our heads. Professor Whitehead's theory of objects and events does not attempt to overcome this antithesis. We are left with the relation of "ingression" between them. Our world persists in falling asunder in this way, leaving the relation between sense-objects (or percepts) and other entities as a thorn in the flesh of monistic philosophers.

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FLORIAN CAJORI

February 28, 1859-August 14, 1930

IN the death of Professor Florian Cajori the world has lost one of the best-known of its recent historians of science, not merely in the domain of mathematics but in the contiguous domains of physics, geodesy, and to a certain extent astronomy. Beginning his contributions to the history of mathematics while he was professor of physics at Colorado College, his first important work, *The Teaching and History of Mathematics in the United States*, appeared in 1890, when he was thirty-one years old. This was followed four years later by *A History of Mathematics* (1894), and after two years more by *A History of Elementary Mathematics* (1896). Of these two, the former was revised in 1919, and the latter in 1917. During his nine years in the department of physics (1889-1898) he became so deeply interested in the development of the subject that he wrote a *History of Physics* which was published (1899) the year after he assumed the duties of professor of mathematics (1898-1918) in the same institution. In this period he added to his duties those of dean of the college of engineering (1903-1918), also finding the time and opportunity for beginning his real work as a student of source material. To this he was encouraged by the honor of a call to contribute to volume four of Cantor's well-known treatise, the *Vorlesungen über Geschichte der Mathematik* (Vol. IV,

1908). This led him to the study of the development of arithmetic during a definite period and to a consideration of sources not so essential in his earlier works. The spirit thus awakened showed itself in the *History of the Logarithmic Slide Rule* (1909), his most valuable contribution up to that time. This in turn led him to the study of the lives of individuals connected with this instrument, among whom was the subject of his first biographical work, *William Oughtred* (1916), one of the leaders in the popularizing of mathematics in the first half of the seventeenth century.

Not only had Professor Cajori now found his place, but the place now found him. In 1918 he was called to the University of California as professor of the history of mathematics, doubtless the first man in the world to hold this title and be given the privilege of devoting all of his time to the subject. It was a great opportunity and the appointment was fully justified in the twelve active years that remained. In this period were published the *History of the Concepts of Limits and Fluxions in Great Britain from Newton to Woodhouse* (1919), the *Early Mathematical Sciences in North and South America* (1928), *The Chequered Career of Ferdinand Rudolph Hassler, First Superintendent of the United States Coast Survey* (1929), and the *Magnum Opus* by which he will be most widely known, the *History of Mathematical Notations* (2 volumes, 1928, 1929).

Not only was he a writer of books, but he was an indefatigable contributor to scientific journals in this country and abroad. The number of these journals and of his monographs is impressive and his numerous articles will long be looked upon as material from which historians will draw.

Born in Switzerland, coming to this country at the age of sixteen, educated at the University of Wisconsin (B. S.

1883) and Johns Hopkins (1884-1885), he began his teaching as assistant professor of mathematics at Tulane University in 1885, continuing at Colorado College (1889-1918), and closing his labors at the University of California (1918-1930). As to his work in these institutions, as to the academic honors bestowed upon him (Ph. D., Tulane, 1894; LL. D., University of Colorado, 1912, and Colorado College, 1913; Sc. D., Wisconsin, 1913), and as to his membership and official positions in various learned societies it is not possible, in the space here allowed, to speak in detail. Suffice it to say that his work was faithfully performed and the honors were worthily bestowed. Standing as the leading historian of mathematics in this country, his loss will be deeply felt by all who knew him, whether personally or through his contributions to the subjects of his major interest.

DAVID EUGENE SMITH.

SOME RECENT BOOKS

Proceedings of the First Indian Philosophical Congress Held in Calcutta University, December 19-22, 1925. Edited by Satischandra Chatterjee. Calcutta, The Calcutta Philosophical Society, 1927. Pp. xxiii + 469. 10s.

Even though this volume of Proceedings omits such papers read at the Congress as have elsewhere been published, the material is so rich that one cannot but be impressed with the quality and the range of philosophic thought in present day India. In addition to Rabindranath Tagore's presidential address, the Proceedings contain eighteen papers in the field of Indian philosophy, ten papers on logic and metaphysics, eight papers relating to the philosophy of religion, four papers read in the Section of History of Philosophy, and three in the Section of Ethics and Social Philosophy. The volume should be made accessible to all serious students of philosophy.

A Debate on the Theory of Relativity. By Robert D. Carmichael, Harold T. David, William D. MacMillan and Mason E. Hufford, with an introduction by William Lowe Bryan. Chicago, The Open Court Publishing Company, 1927. Pp. viii + 154. \$2.00.

This debate, in which the first two authors mentioned (mathematicians from the University of Illinois and from Indiana University) argued in favor of the theory and the last two (an astronomer from the University of Chicago and a physicist from Indiana University) opposed the theory, gives to the intelligent reader an unusually lucid and interesting account and appraisal of the work of Einstein. The debate was originally arranged by the Indiana chapter of Sigma Xi, where it was staged shortly before the manuscripts were made available in print.

The Public and its Problems. By John Dewey. New York, Henry Holt & Co., 1927. Pp. vi + 224.

In this book Professor Dewey scrutinizes our democratic state, the historical factors upon which its emergence depends, the sources of its present failure to function, and the indispensable conditions for its realization. Of additional interest are significant redefinitions of such concepts as "individual" and "social," "private" and "public," and the "state"—all of this in the light of the writer's "consequence" theory. Though constructive as well as critical, this study does not regard as significant or legitimate the search for a concrete program purporting to bring political salvation.

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